ELECTRICAL REVIEW

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High Standards

Guarantees of Quality and Performance

WITHIN recent years a popular tendency to deprecate standardization as equivalent to a flat uniformity seems to have given place to an appreciation of its effectiveness in certain circumstances. The change in outlook no doubt owes much to the spectacular achievements in munitions output made possible by this means during the war. To-day the over-riding need to export calls for a similar concentration of effort, with the important differences that expense has to be taken into account and that the products required are the well established lines of manufacturers.

Not Mere Uniformity

An expedient to meet short-term emergencies cannot, however, be regarded as applicable to long-range policy without inhibiting progress. Possibly public opinion has swung too far in attributing intrinsic merit to standardization in the commonly understood meaning of uniformity—a meaning that ignores the possibility that one good custom may corrupt the world and also the truth of the thought behind the expression "creative diversity." Actually the dictionary definition of standardization does not encourage the use of the term in this sense but implies little more than a basis for comparison of excellence for a particular purpose.

A timely corrective to misapprehensions on this score, with their undesirable reactions on national character, was given by Mr. Percy Good in his presidential address to the Institution of Electrical Engineers last week. In discussing the objects of the organization which he directs (the British Standards Institution) —mainly, in brief, that purchasers and manufacturers shall "speak the same language" in assessing the value of equipment on strictly comparable bases of measurable performance and quality—the President showed how pitfalls have been avoided in the procedure that has been evolved. This includes a condition of the first importance, that after manufacturers have pooled their experience (through an independent body acting under the ægis of professional institutions) of what can be economically produced, each must be left to develop his own designs in the light of his intimate knowledge of workshop practice.

Saving Time and Expense

The elimination of redundant types and the simplification this allows, in addition to the saving in thought and time otherwise incurred in preparing specifications in meticulous detail, help materially in increasing output at lower costs. Difficulties in securing the adoption of standards (which are drawn up only to meet a demand for them) indicate a need for educating users regarding the heavy additional production costs incurred through nonconformity. Modifications in detail that appear to arise from individual whims are still too common; notorious examples of this have been furnished by distribution cables and transformers.

Regarding the future, the British Standard published last year for high-voltage lines may be a pointer. It is the only one

we can recall in which the British Standards Institution has gone beyond establishing criteria of quality and performance and tests to prescribe details of design. Safeguards against inflexibility lie in the optional use of other materials and methods of construction. An inducement to its adoption is that the Electricity Commissioners will (when timber becomes available) accept the design without asking for supporting particulars and drawings.

Mr. Good has proclaimed his adherence to the faith of his predecessor in the presidential chair that electricity will not long hence supersede all other sources of energy for all purposes. The democratic methods of discussion promoted by the B.S.I., which secure co-operative working without weakening competitive endeavour, will undoubtedly make an indispensable contribution to this most desirable aim.

The New Minister

MR. GAITSKELL, the new Minister of Fuel and Power, served an educative apprenticeship so far as electricity supply is concerned during the passage of the Electricity Bill through Committee and the House of Commons. He handled his share of the business, as Parliamentary Secretary, very competently and should be at least as capable as his predecessor of administering the new Act. Whether he will be as successful with the coal industry is not so certain; both Major Lloyd George, the first Minister, and Mr. Shinwell were victims of circumstances which still prevail. But Mr. Gaitskell will at least be able to shelter behind the National Coal Board and the British Electricity Authority and we suggest that he gives the latter as free a hand as possible, both for the good of the industry and the public and for his own peace of mind.

Dollar Deficiency

AT his first Press conference as "economic co-ordinator" Sir Stafford Cripps painted a not very bright picture of the situation. He said that even if we succeeded in balancing our exports and imports (in sterling) there would still remain a deficit in our dollar transactions. This could be bridged only by direct exports to the United States (considered impossible of achievement), by securing payment convertible into dollars for our exports to other countries or by futher cuts in dollar imports. In the electrical goods and apparatus field we are still importing much more from the United States and Canada than we are supplying to those countries. Fortunately this is more than compensated for by favourable balances with other "hard currency" countries whose payments are convertible into dollars, notably Sweden, Portugal, Argentina and even Switzerland, to all of whom we are exporting a great deal more than before the war. Thus the electrical industry is doing something to mitigate the dollar shortage and doing it by the most desirable means, that is "multi-laterally."

Load Spreading

So far the effect on power station peaks of the rearrangement of factory hours has been generally disappointing. Comparison between national load curves before and after the load-spreading scheme came into force on October 6th shows a reduction of barely 3 per cent in the demand, which is by no means compensated for by an increase of some 5 per cent throughout the night. Allowance must, of course, be made for difficulties in making adjustments to suit the new conditions in industry, but the most uncertain factor is the extent to which domestic and commercial heating fluctuates with even small variations in external temperatures. Doubts entertained by household consumers regarding fuel supplies are likely to prove an adverse influence in the coming winter.

Atomic Energy

PRESENT indications are that radio-active materials and separated isotopes will shortly be available from the atomic research station at Harwell for medical, agricultural and industrial purposes. In the Third Report of the Select Committee on Estimates, referred to in this issue, unfortunately less confidence is shown regarding the prospect of getting a ton of uranium to do the work of 3 million tons of coal in providing electrical energy. Indeed, doubt is expressed about the practical possibility of doing so, but there is a hope that a plant depending only partly on uranium may be running within a few years. Even so, considerable operational experience will be necessary before its costs can be compared with those of coal-fired stations.

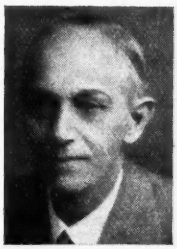
Aspects of Standardization

I.E.E. Presidential Address

INDUSTRIAL standardization was the main theme of the inaugural address of MR. PERCY GOOD (British Standards Institution) as the new president of the Institution of Electrical Engineers.

The address was prefaced with a declaration of faith, that the time was not far distant when all energy consumed industrially and domestically would be in the form of electricity, by whatever means the latter was produced. Without any intention to decry the efforts being made to secure the most efficient use of any kind of fuel, Mr. Good urged that the technical efficiency of an appliance was not the only measure of its value.

There was no substantial case, in his opinion, against some form of national control of any public service wherein competition was unwarrantable. In the case of the electrical industry, however, such control should be confined to the generation and distribution sections, and not extended to the manufacture of machinery or equipment.



Mr. P. Good, President I.E.E.

Turning to his main theme, the president did not deal in any detail with electrical standardization; his endeavour was rather to outline the basic principles underlying the application of standardization to all industries and to record steps taken by the I.E.E. to encourage its development.

Defining the meaning of industrial standardization Mr. Good explained that from the earliest trading days standards for comparing or measuring quantity had been necessary. But to-day in a very large number of cases weight, area, or volume were not significant in determining the suitability, or value, of a product so standards were needed to enable properties which were significant to be assessed in comparable terms. An analysis of the industrial standards in use to-day showed that they took one or more of the following forms.

Quality and Suitability

First, standards of quality, fitness for purpose or performance. At present requirements often had to be included which would only be assessed subjectively, but research was steadily providing the necessary data to enable requirements to be expressed with precision. Then it would be possible to avoid the use of loose expressions to define quality.

Secondly, dimensional standards for interchangeability and the elimination of unnecessary types and sizes. Mr. Good said he was satisfied that an inquiry should be made by each industry into the economics of this aspect of the matter. Past experience also caused him to urge that each industry should consider how best to secure the general adoption of its standards when it had prepared them. It once became necessary to use force against sea pirates; might it not be necessary too for industry to do the same against industrial pirates?

Certification Marking

Thirdly, standard methods of sampling and certification marking, were an inheritance of early trading practice and necessarily of the character of gambling. Only comparatively recently had mathematical treatment been employed to ensure that the samples fairly represented the bulk. Trade marking, said Mr. Good, conveyed to the purchaser just as much, or as little, information as the manufacturer wished him to have. It differed fundamentally from certification marking by an authorized non-trading organization for conveying information which the purchaser was entitled to have and could accept with assurance of its validity. Anxiety had been expressed in some quarters lest the use of a certification mark to indicate conformity to a standard might diminish the value of the goodwill of a manufacturer's own trade mark. An outstanding example of the contrary was the way in which hall-marking since 1300 had helped British goldsmiths and silversmiths to establish and maintain their reputation in the markets of the world.

Fourthly, standard terms, definitions and symbols because the meanings of scientific, technical and trade terms should not depend upon context. The function of a dictionary was to give all accepted meanings, whereas that of a glossary was to fix one meaning.

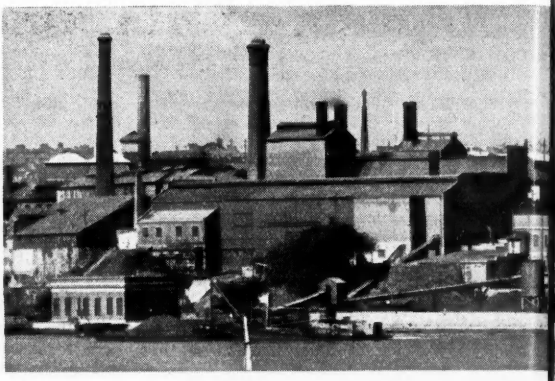
The definition of a trade term had something of the character of a specification and frequently limited the meaning which previously had been loosely applied. There were some 600 scientific and technical words (omitting the medical use of Latin) which were sufficiently alike for the written word to be recognized. Mr. Good asked the I.E.E. to consider whether anything could be done to secure that, in future, new scientific and technical terms were the same in all the principal languages.

Twenty-eight countries had set up national standards organizations very much on the lines laid down for the B.S.I.

Physical Society's Exhibition

Next year's exhibition of scientific instruments and apparatus organized by the Physical Society is to be held from April 6th to 9th.

Extension of BALMAIN POWER STATION



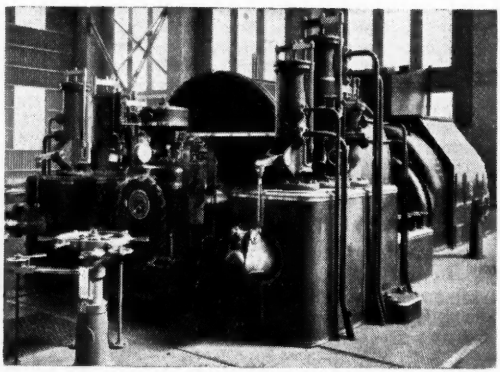
First High-Pressure Superposed Set in Australasia

OPERATING results in full commercial service for some months have made the Balmain harbour power station, as now modified, noteworthy in two respects. It contains the first superposed turbo-alternator to be installed in Australasia and, moreover, is operating at nearly double the steam pressure utilized by any other plant in that part of the world.

The benefits of superposing 7,500 kW (economic rating) of turbine capacity have been a net gain approximating to 20,000 kW of station capacity together with a very substantial improvement in overall station fuel economy which, during the ensuing years, should mean that three tons of fuel will produce about as much electrical energy as four tons has done hitherto. By reason of the shortage of fuel, which now costs 50 per cent more than it did before the war, the benefits which economically favoured superposition in this particular instance when the scheme was initially projected seem likely to be greatly exceeded.

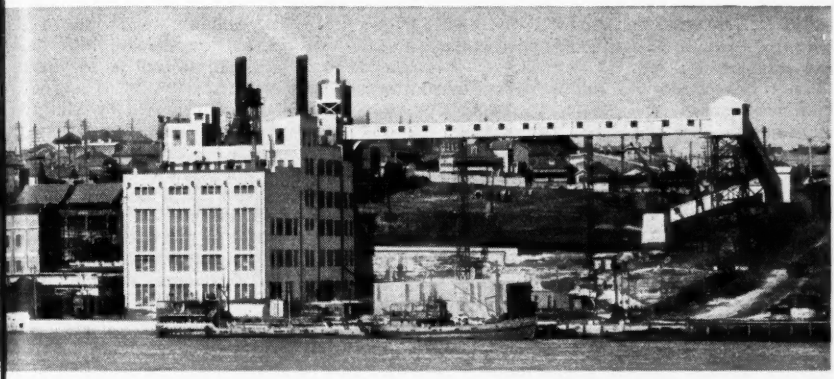
The title illustration is a general view of Balmain from the Drummoyne bank of the Iron Cove, Sydney, showing low-pressure "A" station (left) and high-pressure "B" station (right) with switch house between them

The station is shown in the title illustration from the Drummoyne bank of the Iron Cove harbour in Sydney, N.S.W., with the switch house between the older portion (left) and the new (white building) with the coal-handling plant to the right. The two portions are some 200 ft apart; the exhaust from the back-pressure turbine is conveyed by a pipeline 390 ft long to the steam range in the old station, whence the condensate from the low-pressure turbines is returned through a 6-in. diameter pipeline to the feed water system of the new high-pressure boilers.



The large increment of station capacity effected by superposition in this case, without involving any redundancy of the older plant, is due to deficiency of the original boiler capacity, which sufficed only for 27,000 kW whereas the three associated turbo-generators, of British and Continental makes,

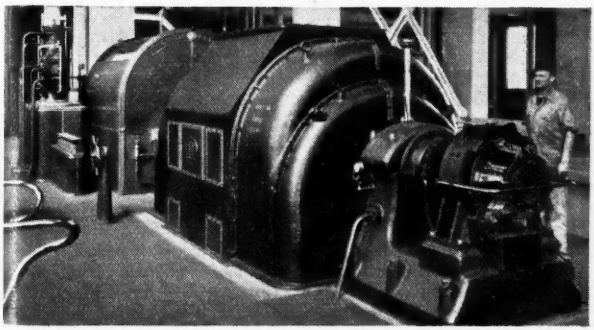
Left: Governor end of back-pre turbo-alternator
Right: Exciter end of back-pressure t alternator



are of 18,750 kW, 12,000 kW and 9,000 kW at 225 lb per sq in. and 700 deg F. The back-pressure machine now operates in conjunction with the largest of the low-pressure sets alone, or with both the smaller sets together.

This high-pressure set is of English Electric construction, the duct-ventilated alternator being of 9,375 kW at 0·8 p.f. (m.c.r.), generating at 6·6 kV and 50 c/s, three-phase. It is directly driven at 3,000 r.p.m. by a horizontal impulse turbine of single-cylinder 18-stage design, with steam entering the stop valve at 1,200 lb per sq in. and 900 deg F (although designed for 930 deg F without harm) against a back pressure of 225 lb per sq in. at the exhaust.

In addition to the usual centrifugal governor, an "Askania" regulator in the exhaust maintains constancy of back pressure. It is connected through an oil relay to the same system of levers as the governor, actuating the pilot valve which regulates the steam throttle. Motor-driven barring gear is provided for turning the rotor during warming-up and shutting-down periods.



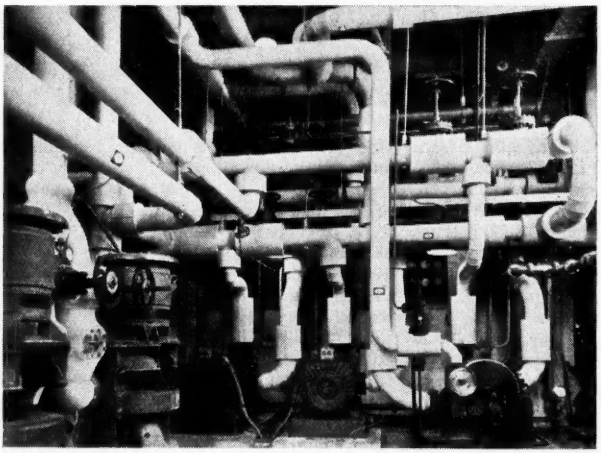
The two boilers are of the Babcock & Wilcox high-head series type, each of 125,000 lb per hr (m.c.r.) or 100,000 lb per hr normal, at 1,250 lb per sq in. and 915 deg F at the outlet of the superheater. The latter is of the continuous loop type, in two sections immediately above the main bank of boiler tubes; the first high-temperature portion has 2,020 sq ft of heating surface and the second lower-temperature portion has 3,890 sq ft of surface. Interposed between the two sections is an "attemperator" for controlling the steam temperature within ± 10 deg F of 915 deg F.

The steaming economizer is of the continuous loop type built up in three banks, forming 8,800 sq ft of heating surface. Between it and the superheaters is a laneway, the walls of which consist of water tubes carrying refractory tiles. Within this lane are swing dampers for by-passing a portion of the flue gases past the superheaters when raising steam, or for coarse adjustment of steam temperature. Twelve single-jet retractable and four multi-jet element soot blowers are fitted.

The air heater is of the plate type with 12,480 sq ft of surface. The air fans are of Howden make; those creating forced and induced draughts are

driven by squirrel-cage motors with hydraulic couplings for speed variation. Twin shunt suction grit collectors are incorporated in the induction fans.

Both boilers operate under Bailey full automatic control and Bailey water-cooled walls protect all four surfaces of the furnace. The chain grate stokers, of 330 sq ft area, are designed to burn coal or a mixture with coke on the sandwich system, consuming 1·2 lb per kWh generated (and 1·3 lb per kWh sent out) compared with 1·6 (and 1·7 lb) burned by the older boilers in the low-pressure part of the station.



Boiler water feed-booster pumps, and lagged piping

Coals varying from 9,000 B.Th.U. per lb with 35 per cent ash to 13,700 B.Th.U. per lb with 5·5 per cent ash have been used. Coke breeze of 9,500 to 10,500 B.Th.U. per lb with 15 to 20 per cent ash has been continuously consumed on the sandwich system, proportions as high as 70 per cent coke to 30 per cent coal having been used for an extended period.

Somewhat improved and slightly more efficient combustion occurs when utilizing up to 60 per cent coke than with coal alone, seemingly because the coke forms a more homogeneous fuel bed next to the grate surface, by this means causing the flow of air upward through the fire to be more evenly dispersed.

Ash is removed by a submerged rubber belt conveyor made by John Thompson (Aust.), Ltd., and designed with sufficient capacity to serve a future total of eight boilers, each of the same size as the two now in service. The riddlings and fine ash hoppers are emptied by sluicing into the submerged belt trough, as well as the dust from the grit collectors.

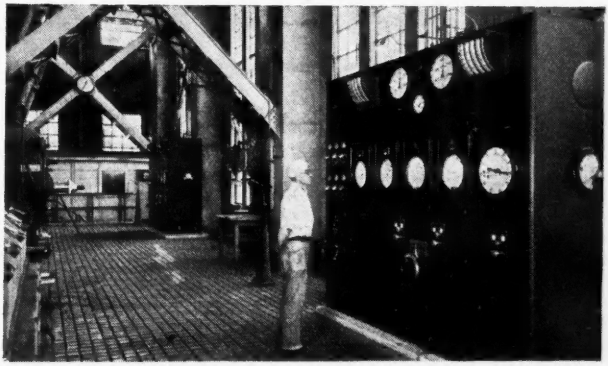
Boiler feed water is furnished by Mather & Platt pumps, booster and main, in two groups with four feed heaters interposed between them. Each group is composed of two motor-driven sets and a stand-by pump driven by a steam turbine, which is started automatically by fall of pressure in the feed water main. All the pumps are of the centrifugal section-built type, raising the pressure of the water in seven stages in each of the booster pumps and twelve stages in each of the main pumps; from 50 to 500 lb per sq in. by the boosters, then up to 1,500 lb per sq in. by the main pumps. The boosters suck water from the extraction pumps of the condensate de-aerator, which is of the simple Hick Hargreaves mechanical type.

The pressure of the feed water is regulated by varying the speed of the pump motors, either manually or automatically by Ruggles-Klingerman equipment. The feed water is conditioned by pump injection continuously of measured doses of the requisite chemicals into the condensate system between the de-aerator and booster pumps. Similar dosage of individual boilers is effected by slug injection into the drum.

The feed water is heated to 350 deg F in five stages; the first consists of bled steam heaters, which are integral with the low-pressure turbines in the old station; the second and third utilize leak-off steam from the back-pressure turbine glands through de-superheaters; the fourth receives steam from the evaporators or, alternatively, from the turbine exhaust through a reducing valve and de-superheater; and the final stage employs steam direct from the turbine exhaust through a de-superheater. There are

two evaporators of raw make-up water, operating singly or in double effect.

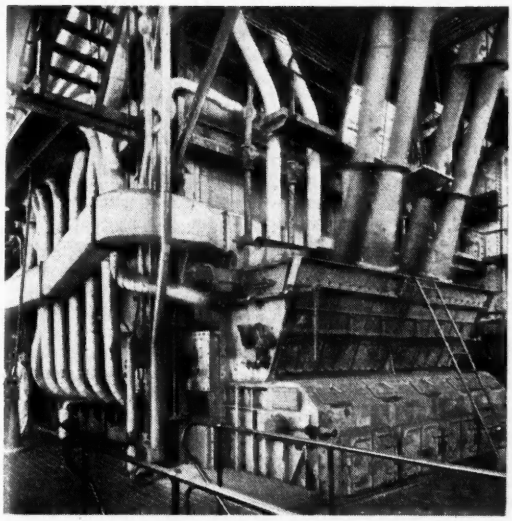
All of the station auxiliaries operate at 415 V, three-phase,



Boiler firing aisle, showing control panels, looking towards older station

derived from four 1,000-kVA step-down transformers ring connected on their primary sides to each end of the station main busbars, with provision for isolation and protection. Two of these transformers are in the old portion of the station; the other two are in the new power house, in a substation in which are centralized all the starting contactors for the larger auxiliaries, which are actuated distantly by local push-buttons beside the driven machines.

Most of the automatic controls are operated by compressed air, including those of the high-pressure boilers, various reducing valves and de-superheaters. One of the duplicate compressors is a stand-by set that is started automatically by fall of air pressure.



One of the high-pressure boilers from firing floor level

The high-pressure installation was first put on load in January, 1946, for testing; then closed down for 23 days in April for adjustments before going into full commercial service in May, 1946. It is owned by the Electric Light & Power Supply Corporation (general manager Mr. H. G. Condé, power station superintendent Mr. F. Sykes). They consider it reasonable to assume that, based on "units generated," a thermal efficiency of 24·5 per cent should be attainable with a machine (back-pressure set) load factor of 80 per cent and 22·8 per cent based on "units sent out." With the loading conditions anticipated and the future availability expected of the new plant, it seems likely that the superposition will raise the overall annual thermal efficiency of the Balmain station from 17·52 per cent in 1945 to at least 23·5 per cent, representing a saving of more than 25 per cent in fuel.

This water-side site is capable of accommodating 300,000 kW of plant and a second high-pressure set of the same make, of 25,000 kW straight condensing, has already been delivered on site. It will involve duplication of the high-pressure boiler installation.

We are indebted to Mr. Ranald J. Harvey, M.Inst.C.E., consulting engineer, for assisting in the preparation of this article and for the loan of the illustrations.

Views on the News

Reflections on Current Topics

DIFFERENT views on the treatment of consumers are held by different local authorities. At Morley (Yorks), fearing a deficit, the Council put up the price of electricity to domestic consumers by 10 per cent last year. This resulted in a profit of £8,000 and one member of the Council moved that this should be returned to the consumers by way of rebate. Although the amendment was not accepted it was agreed by a small majority to refer the matter back to committee.

At Worthing, where a profit of £33,000 was made last year, over £20,000 has been returned to the consumers by means of discounts in the first two quarters of the current financial year. As there is a prospect of a further profit this year it has been decided to give 10 per cent discounts in each of the other two quarters. In view of the imminence of nationalization the Council is losing nothing of course.

* * *

Despite the decision of the Bolton Corporation Electricity Committee some weeks ago to re-advertise for the position of electrical engineer and manager at a salary in accordance with the national agreement, it would appear that the Town Council is still unwilling to adopt the scale. A report has reached me to the effect that the Council is to approach the Minister of Fuel and Power in an effort to avoid paying the higher rate. An earlier appeal by the Council to Mr. Shinwell, the late Minister, to intervene, was rejected, and it is doubtful whether Mr. Gaitskell will feel inclined to do anything about it.

* * *

Fumes from the Spondon station of the Derbyshire and Nottinghamshire Electric Power Co. are alleged to have killed ten trees in the neighbourhood and the Spondon Parish Council is to ask the Ministry of Fuel and Power whether the station cannot be supplied with a less sulphurous type of coal. In this, I think, the Council is a little sanguine.

The Power Company has also got into hot water recently over its cooling arrangements. Or, to be more exact, its hot water has got into the Derwent and is said by the Trent Fishing Board to have been responsible for the death of between 7,000 and 10,000 roach. This renders the fish useless to anglers and to epicures who, I am sure, could not stomach boiled roach.

* * *

Two or three weeks ago I mentioned the proposal of three electricity supply companies in West Wales that their consumers should spread their washing days over the week instead of using all their wash-boilers on Monday. I was a little doubtful about this attempt to break down an immemorial custom and, judging by a report in the *Daily Mirror*, my doubt was justified. According to the manager of the companies, only one reply was received to a circular letter (of which 2,000 copies went out) and this was "a mild objection to the scheme." It is something, however, that the manager has convinced his wife of its soundness. Anyway, these Welshwomen are unwise to turn the plan down for if their persistence results in load shedding they will be forced to revise their ideas.

* * *

Mr. H. W. Grimmitt, of the Electricity Commission, made a good point when addressing a group of Cambridgeshire parish councils recently. He said that electricity supply was available to practically every village, but only about 15 per cent of the parish population actually lived in the village; the rest were scattered over very wide areas which made service to them extremely costly. He urged the Councils to see that new houses were erected near one another in their parishes. Unfortunately this concentration might mean that some agricultural workers would be far from their farms, but no doubt reasonable groups of houses could often be planned to lower the cost of service.

* * *

From "Secret History" in *Reynolds News:*—

> "Second-hand racket in electrically driven cars has risen steeply in the past week. Several small garages are offering to put electrical engines into ordinary cars for a handsome price."

—REFLECTOR

District Heating

London and the Dundee Example

By L. F. Stemp,
B.A., LL.B., Barrister-at-Law

A RECENT decision of a Select Committee of the House of Lords related to powers sought by the London County Council to supply district heating. The relevant clauses, as incorporated in the London County Council (General Powers) Bill, were altered materially from those originally proposed, largely as a result of opposition by the Conjoint Conference of Public Utility Associations.

The powers sought in the first instance were to apply also to all Metropolitan Boroughs and would in some cases have permitted them to supply district heating outside the London area. The provisions differed considerably from those granted to the Corporations of Manchester and Dudley in that, instead of establishing a separate undertaking with its own independent accounts, they proposed to authorize the London Councils to supply heating by hot water or steam and hot water as part of general powers as housing authorities.

A House of Lords Select Committee has decided that the proposed Westminster district heating scheme shall be subject to certain regulations, largely to safeguard gas and electricity undertakings, and that separate accounts shall be kept

The petition of the Conjoint Conference submitted that:—A local authority supplying district heating should be subject to the restrictions and obligations regarding maintenance of supply, price control, etc., normally imposed by Parliament upon a public utility undertaking; district heating schemes should be economically self-supporting and not rate-aided; tenants who preferred electricity or gas should not be forced to pay for district heating; rent remedies, such as distraint, should not apply to district heating charges.

After the deposit of this petition the L.C.C. confined its application for district heating powers to specified estates in the City of Westminster which could be supplied from the Battersea power station. The proposals were to be restricted to the supply of heat, the supply of hot water being eliminated.

During the hearing before the Select Committee, presided over by Lord Rushcliffe (Sir Henry Betterton), which opened on July 15th and occupied five days, reference was made to the district-heating installation at Dundee. This has been in operation twenty-five years and is the only substantial scheme in Great Britain at the present time. The dwellings, two- and three-roomed flats, are provided all the year round with heat and with 70 to 80 gal. of hot water per flat per day, against an estimated 40 gal.

The original weekly charges were 3s. 6d. for a three-roomed flat and 4s. 3d. for a four-roomed flat. In 1945-46 a loss of £5,123 was incurred, despite the withdrawal of the total accumulated reserve (£2,285) and the non-payment of interest on the £45,000 capital and of local rates. Charges were raised to 5s. 6d. and 6s. 6d., but a substantial loss is nevertheless anticipated in the current year. It was suggested in evidence that the high cost could not be attributed to inefficiency in operation but was inherent in the scheme. It was further submitted that where electricity or gas was used for supplementary heating, winter peak loads would be created. Either service would be denied the water-heating load, which could be met at low cost if it was required to meet demands for cooking and lighting also, which were beyond the scope of district heating.

The decision of the Committee on the points raised by the Conjoint Conference was as follows:—

The scheme for district heating is to be restricted to heat from the Battersea power station, and should not be regarded as a precedent for general application.

The district heating scheme is to be treated as a separate undertaking, and an amendment to the Bill provides that the accounts shall show the financial position of the undertaking, distinguishing capital from revenue. The revenue is to show all receipts and payments, including working, establishment and maintenance expenses and sinking fund payments.

District heating charges are to be alike in like circumstances within each area and are to be shown separately in rent books, demand notes and receipts. They are not to be recoverable by distress, but the Council is to have power to cut off supplies

to tenants who have not paid such charges. The Westminster Council is to render such reports to the Minister of Health as he may require, and any statutory body carrying on electricity, gas or water undertakings within the area of supply shall be entitled to receive a copy of such reports as may affect their working, except so far as the Minister may consider that publication would not be in the public interest.

The Select Committee agreed that district heating should be subject to regulations made by the Minister of Health. The amendment incorporated in the Bill provides that the Council shall submit plans and sections to the Minister before executing any work, and in addition supply particulars of measures to be taken with respect to safety, insulation, and maximum and minimum temperatures and pressures which the Minister may deem should be regulated in the public interest after considering any representations made thereon.

The Select Committee also agreed that a highway protective clause should be incorporated in the Bill. This clause contains the following provisions:—

Plans, sections, particulars and other reasonably required information are to be supplied to public utility undertakings in the area.

If the district heating works would detrimentally affect the apparatus of public utility undertakings or impede their supplies, the Westminster Council may be required at its own expense to alter the position of public utility apparatus.

Nothing is to be done in this connection until the Council, at its own expense, has provided substitute apparatus.

Public utility undertakings may themselves carry out any of the above work at the expense of the Council.

The Council is to pay the cost of repairs and renewals of public utility apparatus rendered necessary by district heating works, or subsidence caused thereby, for three years.

The Council is to pay for damage, loss or cost resulting from its district heating system, including damage to the services of private consumers.

The Committee also agreed that the Westminster Council, as a district heating undertaking, should be liable to the common law obligations regarding nuisance.

Municipal Reports

Chichester.—Although the period covered by the annual report of the city electrical engineer and manager (Mr. E. H. Skinner) was the first full year since revised tariffs came into force, the average price obtained per kWh sold (1·49d.) was only 0·02d. higher than in the previous year, and was actually less than the 1944-45 figure (1·53d.). For this the marked increase in domestic and business two-part tariff supplies was largely responsible. These rose by 27 per cent to a total of 19·3 million kWh out of aggregate sales in the area of 26·8 million kWh. Although only 18 per cent of the undertaking's sales were for purely power purposes, the average kWh sold per consumer reached the high figure of 2,640 (750 kWh per head of the population). Revenue for the year amounted to £246,129, working expenses being £215,776, and there was a net profit of £6,024 (against a loss of £5,127) £4,200 of which has been applied in aid of the rates.

Colchester.—Commenting on the fall in load factor to 36·89 per cent, the borough electrical engineer (Mr. G. P. Dixon) says that under present circumstances there is little that the engineer of an undertaking can do to improve his load factor. He cannot stimulate any particular class of load because the consuming appliances are in short supply. In the case of Colchester the weekday industrial load is diminished by the Regional Board for Industry's request that factories shall reduce their demands by 30 per cent. In consequence the undertaking is left with a Sunday peak load about 2,000-3,000 kW in excess of weekdays. In such a manner, he says, is undermined the economic basis on which electricity supply has been painstakingly built up. The report shows that the maximum demand during 1946-47 of 17,920 kW was experienced on Christmas Day, as in the previous year.

Sales last year aggregated 51·1 million kWh, an increase of 13·3 per cent, and the engineer speaks of the " incessant demand for electricity from all quarters." Revenue rose by £49,909 to £382,678 and working expenses by £62,046 to £312,514, the net result being a small deficit of £491 against £207 in 1945-46. The average price received per kWh sold was 1·839d. Consumers numbered 33,089, an increase of 1,113. The power station was run for 8,544 hours—the most since 1932-33—and generated 11·4 million kWh. The C.E.B. has intimated that it will be needed until 1951.

Kettering.—The past year's accounts of the Electricity Department (electrical engineer, Mr. C. Binns) show a net loss of £2,760, revenue amounting to £722,735 and working expenses to £688,032. Sales of electricity increased by 18·5 million kWh to 185·0 million, the number of consumers at the end of March last being 24,300.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Non-Ohmic Resistors

THE discussion regarding this has lacked precision as I did not then have the authoritative description of the Metro-Vick non-ohmic resistors which have brought the term into use and I did not wish to depend on memory. I now have the information that with these C varies as V^4. Hence if an 11-kV overhead line is struck by lightning and its voltage rises instantaneously to 55 kV, the leakage current through the resistance will rise to 3,000 times its normal amount. This enables it to act as a valve and discharge such a surge to earth. Purists may object to the term but it is likely to stay.

Newcastle-on-Tyne. C. TURNBULL.

Electrical Ironmongers

NOTING Major E. C. Holloway's remarks quoted in "Views on the News" in your October 10th issue regarding the urging of sales of electrical appliances in ironmongers' shops, brings us back to the old trouble of the sale of all sorts of goods in all sorts of shops. I should have thought that ironmongers had quite a large field in their own goods and a fairly well protected monopoly.

Having seen the results of such trading, and the sales of "bread and butter" lines by non-electrical trades, apart from the showrooms of municipal authorities, I think that they should stick to their own trade and put more effort into improving the sales of their own commodities.

Croydon. J. VANDELEUR PARISH (Buyer and Electrical Engineer).

High-Voltage Indication

THE article on the above subject in your issue of September 5th is interesting, but it is possible that the author is not aware of the work done by the E.R.A. as a result of which recommendations for the design of potential indicators were made in 1940 (E.R.A. Report, Ref. F/T133: "Potential Indicators for Live Conductor Detection.")

In the course of our investigations we considered the use of neon-tube indicators of the type described by Mr. Ledward, but could not recommend them on account of the fact that the indication given is not quantitative (which was shown to be an essential requirement) and even when the spark gap device is incorporated the indicators are difficult to see in strong daylight.

We described a method by which both these disadvantages could be overcome, and the instrument finally recommended employs alternatively a neon tube or a microammeter. In the latter form it has since been produced commercially for voltages up to 70 kV.

Greenford, Middx. E. E. HUTCHINGS, British Electrical and Allied Industries Research Association.

Armature Drop Testing

OWING to the omission of the sketch accompanying my letter published in your issue of September 5th, some misunderstanding regarding the difference between the terms "crossed connection" and "crossed coil" has arisen.

Mr. Thomerson on September 26th is quite correct in his statement that crossed connections as shown in his diagram will show up on the drop test. But this only applies to continuously wound armatures.

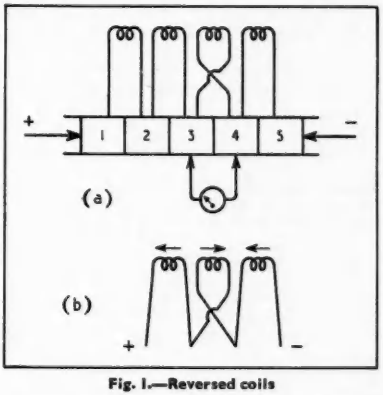


Fig. 1.—Reversed coils

A very common fault on former-wound armatures or those wound with more than one reel of wire, where both ends of each coil are cut, is that only one coil is reversed, as in Fig. 1a. No other coil is affected and there are no double readings. When testing between 3 and 4, 3 will still be positive and

4 negative, and the meter will therefore not reverse. But the current will flow in the opposite direction through the armature core.

This type of fault is not shown up by the drop-test method unless, while making the test, a compass needle is held over each slot in turn, which will then show up a reversed coil (Fig. 1b). I have found in my considerable experience in charge of an armature-testing department that a crossed coil does show up on the "growler," and I should be glad if someone could give me an explanation of this.

*London, N.W.*6. H. BLOCH.

SOME confusion appears to have arisen in this correspondence between cross and reverse connections which are two distinct faults. Cross connections are revealed by the drop test but not by the growler. Reverse connections are not revealed by drop test or growler, and a compass or similar test must be used.

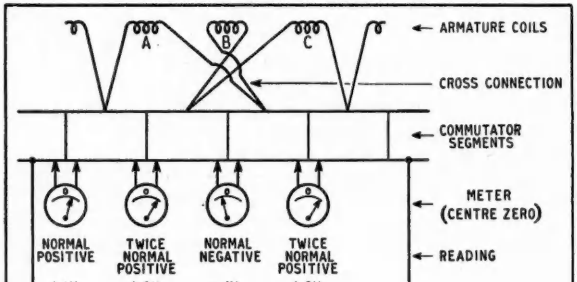


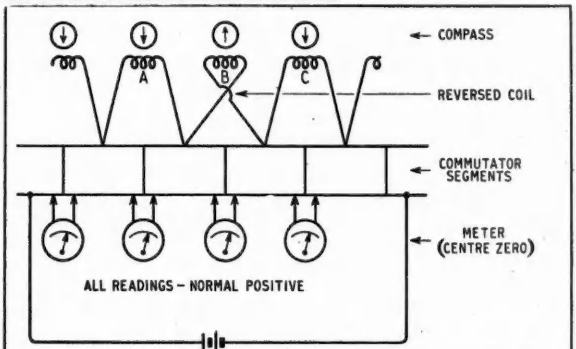
Fig. 1. (above)—Cross connection. Fig. 2. (right)—Reverse connection

In Fig. 1 a cross connection occurs when the finishing end of coil A is correctly connected to the start of B, and the finish of B to the start of C, but in subsequently connecting to the commutator the two junctions have been crossed over, and the milli-voltmeter reads successively double normal, normal but reversed, and double normal. Cross connections are found mainly in machine wound armatures where the leads are formed before the commutator is fitted.

Reverse connections usually occur in former-wound armatures where all the starting ends are first connected to the commutator and then the finishing ends. In Fig. 2 the finish of coil A, instead of being connected to the start of coil B, is connected to its finish, and the start of B is connected to the start of coil C. Although the current flows around coil B in the opposite direction to that of a correctly connected coil, the volt drop and the relative polarity of the commutator bars to which it is connected remain unchanged, and the drop test meter will therefore read "correct" in direction and magnitude. There is no short-circuit condition and so the growler will not operate.

If, however, a compass is applied in succession to the slots of an armature carrying current it will reverse when opposite the slots carrying the reversed coil, as shown diagramatically at the top of Fig. 2.

S. F. PHILPOTT, M.I.E.E.
*London, N.W.*13.



Over-Current Relays

IN his article in your issue of October 3rd, Mr. Salzmann assumes that the directional element is correctly connected if like instantaneous polarity is impressed on the terminals of current and potential coils (of the relay) with power flow to busbar for contact opening.

It is very necessary for this assumption to be stated for I have found that one well-known manufacturer is constructing directional relays which are correctly connected if *opposite* instantaneous polarity is impressed on the terminals, etc., for the purpose of contact opening.

This variation between different makes of the same fundamental type of relay is, I feel, quite unnecessary and it adds to the confusion of thought which is likely to arise in the study and practice of this branch of technology.

Does Mr. Salzmann, and for that matter do any other readers, agree that standardization in this would be a good thing?

Bedford. S. A. DAINES,
Meter and Testing Superintendent,
Corporation Electricity Undertaking.

Potential Death Traps

IN supporting the letter from Mr. Alex Milne in your issue of October 3rd, may I also express a fear that the recent "Grow more Food" drive has encouraged the display, even by quite good-class suppliers of garden requirements, of apparatus which in the hands of the experimenter or non-technical market gardener may hurt the user and restrict the use of apparatus which for comparatively small sales of electricity could be a most profitable field. I refer to the gadgets offered for stimulating plant growth, seed propagation, etc.

Unless the horticulturists can prove a desire for electrical properties other than C^2R, is it not wiser to insist upon the use of low-voltage apparatus transformed in a correct manner from the supply mains, thereby eliminating to a large extent the possible dangers due to defective installations, varying earth current conditions, attendant moisture, rusting and what have you?

Watford. W. B. ASKEW.

N.E.S.C.O.E. Association

THE tenth annual general meeting of the N.E.S.C.O.E. Association will take place at 7 p.m. on October 23rd, thus preceding instead of following the annual dinner to be held at the Royal Station Hotel, Newcastle-upon-Tyne. Sir Arnold Gridley, M.P., will take the chair in the absence of the president, Mr. R. P. Sloan, and the principal guest will be Col. E. H. E. Woodward. Visits have been arranged to the works of C. A. Parsons & Co., Ltd., and A. Reyrolle & Co., Ltd., and to Dunston power station of the North-Eastern Electric Supply Co. earlier on the same day.

C†

Analysis of Consumption

Rapid Growth of Non-Industrial Demand

RELATIVE amounts of electricity consumed by different sections of the community were analysed by MR. W. S. BURGE (manager, Central England Area, C.E.B.) in his inaugural address at Birmingham as chairman of the South Midlands Centre of the I.E.E.

The tabulated figures presented indicated that supplies of energy to factories increased slightly more than four times during the past twenty years, and in 1946 accounted for 51·6 per cent of the total consumption, a prop of 11·1 per cent since 1927. In contrast domestic supplies increased twelve times and represented nearly 32 per cent of the total, a rise of 19 per cent in the same time. Energy for street traction dropped from 7·2 to 1·7 per cent, while supplies to farms, although forty times the 1927 value, still accounted for only 0·5 per cent of the whole.

All classes together increased five times; the industrial growth to 3·86 times in twenty years had been eclipsed by the non-industrial growth to 7·8 times and its still more rapid expansion of over 35 per cent during the last three years, which was remarkable, considering the efforts made to curb the growth of domestic uses. The industrial reduction of 8·4 per cent during the last three years had been due to the exceptional circumstances of post-war reconstruction

Why Electricity is Popular

Changes in the relative prices of coal, gas and electricity furnished an explanation of the increases in non-industrial consumption. The householder could purchase nearly four times as much electricity in 1946 as he could in 1927 for the price of one ton of coal and, moreover, neither coal nor gas could satisfy by itself all the modern domestic requirements.

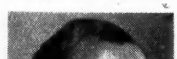
There was a widespread opinion, which was growing, that the present scale of domestic tariffs was uneconomic. Because improvement of load factor resulting from further increases of consumption for non-industrial purposes was of major importance in tariff revision, Mr. Burge proceeded to examine the scope for "closing upward" existing diversities of usage. His instructive comparison indicated a far larger diversity in consumption among the higher class of properties than in either the medium or working classes.

The remarkable advance in consumption by the poorest class of the community could not have taken place were it not for the fact that, while competitive services had become progressively more expensive, the cost of electricity for domestic services had become cheaper. There seemed to have been a change so radical that, whereas a few years ago the all-electric house was regarded as a luxury for the rich, it might in the near future be considered a necessity for the poor. The indications were that non-industrial supplies might in the near future eclipse the industrial total.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE appointment is announced of **Mr. H. F. Carpenter**, F.C.I.S., F.S.A.A., as secretary to the British Electricity Authority. Mr. Carpenter brings to this important position valuable experience gained as clerk and manager in control of the whole of the undertaking of the West Midlands Joint Electricity Authority. He was educated at Bancroft's School, and from 1908 to 1926 (excluding war service) was with the Metropolitan Water Board. On the formation of the West Midlands J.E.A. in 1926 he was appointed secretary and treasurer, a title which was subsequently amended to clerk and treasurer. Following the death in 1938 of Mr. E. F. Hetherington, the chief engineer and manager of the J.E.A., the Authority decided that instead of two principal officers as hitherto there should be one principal officer and Mr. Carpenter was appointed to that position as clerk and manager, Mr. J. Morton, M.I.E.E., M.I.Mech.E., becoming chief engineer.



Mr. H. F. Carpenter

Mr. Carpenter is this year's president of the Chartered Institute of Secretaries, and chairman of the Council of the British Electrical Development Association, and is active in many other directions. During the 1914-18 war he served in Gallipoli, Egypt and Palestine.

This year Mr. Carpenter has paid visits to Canada and the United States on behalf of E.D.A. and to Australia and New Zealand in connection with the fusion of organizations there with the Chartered Institute of Secretaries.

Professor P. I. Dee, C.B.E., F.R.S., and **Sir William Griffiths,** D.Sc., have been appointed members of the Advisory Council for Scientific and Industrial Research from October 1st. **Professor Sir Lawrence Bragg,** O.B.E., M.C., D.Sc., F.R.S., **Professor Sir John Lennard-Jones,** K.B.E., D.Sc., F.R.S., **Sir Andrew McCance,** D.Sc., F.R.S., and **Sir Raymond Streat,** C.B.E., retire from the Advisory Council on completion of their terms of office.

Mr. W. S. Robertson, M.B.E., B.Sc., has been appointed Scientific Contacts and Industrial Information Officer to the Scottish Council (Development and Industry). Mr. Robertson is at present employed in the Department of Scientific and Industrial Research and will take up his new position early in the year. He was educated at Allan Glen's School, Glasgow, and Glasgow University, from which he graduated with first class honours in electrical engineering in 1936. On leaving the University he was awarded a Sir James Caird senior scholarship of £450 enabling him to study at the Technical High School, Dresden. In 1938 he returned to Scotland to conduct a survey of the potentialities of hydro-electric development, and of applications of electric power to agriculture. During the war he was engaged in research and development work on ground and airborne radar equipments and later upon the investigation of German electronic research and development work.

At a public meeting at Portumna, Co. Galway, **Mr. Louis Gordon,** manager of the local power station of the Electricity Supply Board (Shannon Scheme) was given the Carnegie Trust award, and a wallet of notes, subscribed by the local people, in recognition of his bravery in rescuing Mr. Martin, a local man who had become entangled in the electrical machinery of the station. In rescuing Mr. Martin, Mr. Gordon had his right arm and hand broken in four places. It is understood that Mr. Gordon will also receive the State medal for bravery.

Mr. F. C. Orchard, electrical engineer and manager of the Hornsey Corporation electricity undertaking, is to succeed **Mr. A. W. Barham** as general manager and chief engineer of Watford Corporation electricity supply undertaking.

Mr. S. Shaw, A.M.I.E.E., consumers' engineer with the Buckrose Light & Power Co., has been appointed consumers' engineer in the Stafford Corporation Electricity Department.

Mr. J. R. Hunt has been appointed general works manager of Ekco-Ensign Electric, Ltd., with his office at Ekco Works, Southend-on-Sea. This appointment follows the recent merging of "Ekco" and "Ensign" lighting interests in the E. K. Cole subsidiary company and of the new company's development in both the tungsten and fluorescent fields. Mr. Hunt has a wide experience of valves, cathode tubes and electronics manufacture, and his new post will give him jurisdiction over the Ekco-Ensign plants at Southend, Preston and Rutherglen, Lanarkshire.

Mr. J. R. Hunt

Messrs. S. F. Browning, A. E. Grove, and **H. D. Hendrick** have been appointed to the technical staff of Electro Methods, Ltd., and will cover N. and N.W. London, E. and N.E. London, S. and S.W. London respectively.

The wedding took place recently of **Mr. G. E. W. Hird** and **Miss Betty Kay.** The bridegroom was recently appointed manager of Brierfield Electricity Department, after being mains superintendent at Bingley for several years. The bride has for many years been on the clerical staff of the Bingley Electricity Department.

Mr. G. C. R. Eley, C.B.E., has been appointed a director of the National Gas and Oil Engine Co., Ltd.

Mr. W. Dawson Hopkins, M.I.E.E., retired from the position of chief engineer of the Electrical Department of the British Engine, Boiler and Electrical Insurance Co., Ltd., on September 30th. He joined the company thirty-five years ago and has held the position for the past twenty-two years. He is succeeded by **Mr. D. C. Bacon,** M.I.E.E., who has been with the company since 1926, except for the period 1941-45, when he held the position of Chief Electrical Engineer in the Ministry of Supply Directorate of Royal Ordnance Filling Factories.

The British Electrical Development Association has appointed **Mr. Norman Phillips,** of the Metropolitan Electric Supply Co., Ltd., to the post of exhibitions organizer in succession to Mr. C. Warrenne, who recently resigned. Mr. Phillips, who is thirty-seven, was born at Bromley, Kent, educated at Richmond Hill School and, apart from serving in the R.A.F. throughout the war, has spent the whole of his business life with the Metropolitan Electric Supply Co., Ltd. In 1932 he started the advertising and display department of Metesco and its subsidiaries, and in that year he organized an exhibition to inaugurate the electricity supply to one of the Buckinghamshire villages. He organized many full-scale exhibitions for the company during the years 1935-1938.

Mr. N. Phillips

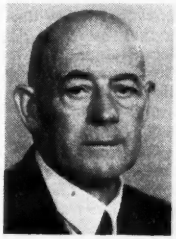
Mr. F. Tomlinson has resigned from Whiteley Electrical Radio Co., Ltd., where he was sales manager. He was with Standard Telephones & Cables, Ltd., for eighteen years before being seconded to the Ministry of Aircraft Production early in 1940. From 1942 to 1945 he was Director of Radio Production. His private address is Denston, 13, Neeld Crescent, Hendon, London, N.W.4.

Mr. W. L. Chance, J.P., who has been chairman of Chance Brothers, Ltd., since 1929, has recently resigned the chairmanship, but still remains a director of the company and of its associated companies. **Sir Hugh Chance** succeeds him as chairman.

Mr. F. A. Crosse (late of the British Thomson Houston Co., Ltd.) has joined Veritys, Ltd., to take charge of the Maxlume Department of their London office.

Edison Swan Cables, Ltd., announces the retirement of **Mr. W. J. W. Bullock,** chief constructional engineer, after fifteen years' service. During that time he has been responsible for the execution of cable-laying contracts at home and overseas. At a farewell party given at the Metropole Hotel, Stockton-on-Tees, Mr. Bullock was presented with a cheque by Sqdn.-Ldr. L. A. Barney, M.I.E.E., A.M.I.Mech.E., on behalf of his colleagues.

Mr. J. Rodgers, who is the chairman of the South Western Sub-Centre of the Institution of Electrical Engineers for the 1947-48 Session, is district manager with the Cornwall Electric Power Co.



Mr. J. Rodgers

Mr. Rodgers received his training at Foyle College, Londonderry, University College, Galway, and Faraday House, London. In 1908 he was appointed charge engineer, Civil Government Electricity Department, Malta, and in 1913 returned to Ireland to take up the position of engineer and manager at Dromore, Co. Down. Two years later he took up a similar position at Ballyclare, Co. Antrim. He joined the Cornwall Electric Power Co. in 1926 as engineer and manager at Launceston, and was appointed to his present position of district manager in 1932.

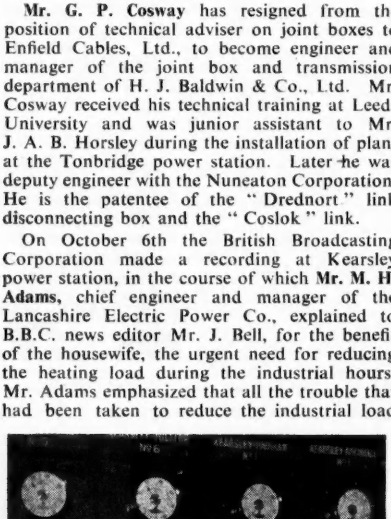
Following the retirement of **Mr. L. Satchwell** as chairman of the Rheostatic Co., Ltd., **Mr. M. J. Gartside** has been appointed chairman of the board; **Mr. T. N. Flight,** vice-chairman and managing director; and **Mr. J. H. Stevens,** deputy managing director. Recent additions to the active directorship of the company are **Lady E. Barber** in place of **Mrs. W. D. Satchwell,** who has retired, and **Mr. R. W. Towers** who, after many years' experience of the sales organization, becomes sales director. Mr. Satchwell, who founded the company twenty-five years ago, remains a member of the board in an advisory capacity.

On September 26th the Mayor of Cambridge, **Councillor F. C. Doggett,** J.P., was entertained at a reception by the board of directors of the Cambridge Instrument Co., Ltd. Councillor Doggett has been a member of the technical staff of the company for forty-three years, and occupies the position of chief designer in the drawing office at the Cambridge Works. He has been a borough councillor for twenty-one years. There were about 200 guests, including the civic dignitaries of the borough and members

of the University, together with all employees of the company having over twenty-five years' service, and the heads of departments from the Cambridge and Muswell Hill works, and from the London office. Speeches were made by Mr. R. S. Whipple (chairman of the company), the Mayor, Mr. F. Wakeham (joint managing director), Mr. C. C. Mason (director), Mr. Morley Stuart, and Canon Partridge. At the close of the proceedings a presentation was made to the Mayor, on behalf of his long-service colleagues, by Mr. S. L. Barron.

Mr. G. P. Cosway has resigned from the position of technical adviser on joint boxes to Enfield Cables, Ltd., to become engineer and manager of the joint box and transmission department of H. J. Baldwin & Co., Ltd. Mr. Cosway received his technical training at Leeds University and was junior assistant to Mr. J. A. B. Horsley during the installation of plant at the Tonbridge power station. Later he was deputy engineer with the Nuneaton Corporation. He is the patentee of the "Drednort" link disconnecting box and the "Coslok" link.

On October 6th the British Broadcasting Corporation made a recording at Kearsley power station, in the course of which **Mr. M. H. Adams,** chief engineer and manager of the Lancashire Electric Power Co., explained to B.B.C. news editor Mr. J. Bell, for the benefit of the housewife, the urgent need for reducing the heating load during the industrial hours. Mr. Adams emphasized that all the trouble that had been taken to reduce the industrial load



Mr. M. H. Adams, chief engineer and manager of the L.E.P. Co., making a B.B.C. recording at Kearsley power station

would be wasted unless the domestic user played his or her part. The recording was broadcast in the Northern News the same evening.

The Operatic and Dramatic Society of the British Thomson-Houston Co., Ltd., opened their winter season on October 7th, with a presentation of Daphne du Maurier's play "Rebecca." It was given by the dramatic section in the Co-operative Hall, Rugby, on October 7th, 8th and 9th to packed houses. The play was produced by Mr. S. S. Bagshaw of the Publicity Department. The next production (in November) will be "The Rebel Maid."

Mr. A. J. Hussey has been appointed manager of the Repairs and Rewinding Department of the Johnson Engineering Co. at Kennington Road, London. He has been with Batwin Electric Motors, Ltd., since 1930.

The St. John Ambulance Divisions of the G.E.C. and associated companies held their second annual competition at the Magnet Club, Witton, on October 4th, when six teams competed for the two challenge cups presented by the Hon. Mrs. Leslie Gamage. These were won by the G.E.C. (Witton) "B" Division and G.E.C. (Witton) Nursing Division, both of whom retained the cups for the second year.

To open its winter programme of activities, the Brook Motors Social Club held a dance in the works canteen on October 3rd. A contest was held for the title of "Miss Brook Motors," in which fifty girls from both Huddersfield and Barnsley works paraded before the judges, who finally selected Miss Vera Eagleton, shorthand typist at the Huddersfield works, for the title. This carried with it a prize of £5, a silver cup, to be retained for a year, and a small silver replica.

Obituary

Mr. J. C. Oliver.—The death is reported by the *Electrical Engineer & Merchandiser* of Mr. J. C. Oliver, general manager of Philips Electrical Industries of Australia Pty., Ltd., which occurred in Adelaide on July 25th at the age of forty-one. Mr. Oliver went from this country to Australia twenty years ago and was at first associated with the Australian General Electric Pty., Ltd., at Auburn, N.S.W. During the war he was production manager of a small arms factory at Lithgow. He joined the Philips organization in 1944 and carried out the transfer of the company's plant from Sydney to Adelaide.

Mr. P. Guercken.—The death, in New York, of Mr. Paul Guercken is announced. He was a former vice-president of the Westinghouse Electric International Co.

Mr. C. B. Gabriel.—The death is reported of Mr. C. B. Gabriel, a director of Gabriel, Wade & English, Ltd.

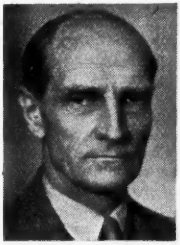
Wills.—**Mr. J. B. Hartley,** formerly in charge of the engineering dispatch department at the G.E.C. works, Witton, who died on June 7th last, left £980 gross, with net personalty £940.

Mr. J. Christie, a former engineer and manager of the Brighton Corporation Electricity Department and city electrical engineer of Londonderry, who died on December 18th last, intestate, left £809 in Great Britain, with net personalty £756.

The 1947 Act

Mr. Nimmo's Address to the A.S.E.E.

SOME of the more important of the 69 sections of the Electricity Act, 1947, were outlined by MR. H. NIMMO (Electricity Commissioner) in his address as president of the Association of Supervising Electrical Engineers for the second successive year. Mr. Nimmo explained that nationalization would not prevent private generating stations being built, subject to approval of the type of current, frequency and voltage to be used. For example, it would still be possible for the National Coal Board to operate the power stations which it owned and to set up new ones. The Transport Commission might do likewise, with the Minister's consent.



Mr. H. Nimmo

It was most important that distribution should be organized on a local basis, not centralized, which view was supported by most informed opinion and was justifiable; every effort would be made to secure that object.

No greater monopoly of supply was to be granted to Area Boards than that already possessed by existing authorized undertakers, into whose shoes the Area Boards would step. Non-statutory undertakers had the option to claim to be taken over in certain circumstances.

Every effort would be made to extend rural electrification, but the demand for greater mechanization of industry must also be considered. The untouched areas were the least profitable and, for that reason alone, the cost of further extending rural electrification in future was likely to be higher in proportion to the revenue derived than it had been in the past. In addition, lack of labour and shortage of generating capacity were likely to prevent the carrying out of large rural distribution for some years.

In the simplification and standardization of tariffs and methods of charging for energy, the recently completed report of the last committee to be appointed by the Electricity Commissioners would be of value to the new Boards.

Mr. Nimmo considered that the need for continued endeavours to lower the cost of generation and distribution and to decrease the consumption of coal justified the giving of power to the British Electricity Authority to conduct research. Its power to manufacture plant and fittings (not for export) had been strongly criticized but, since like power was already possessed by a number of company-owned undertakers through their memoranda of association, it seemed reasonable to grant the Authority similar power.

The Minister and the Authority would not interfere with the day-to-day business of the Boards as distributors. For all practical purposes, they would be autonomous bodies, free to exercise initiative and enterprise.

Consumers had the express right to make representations to Consultative Councils and had thus been given a much more effective voice than they had had in the past. The law as it affected consumers would remain substantially unchanged.

Expansion was generally likely to be so continuous that loss of employment should be rare. The amalgamation of undertakings might cause some chief officers of small undertakings to suffer loss of status, but their emoluments were not likely to be diminished.

An appendix to the address indicated that the sizes of the Areas (based on kWh sold per year) would be comparable with those of the five largest existing organizations, none of which had been considered too large or inefficient.

Mr. Nimmo concluded with the observation that while attending the World Power Conference at The Hague last month he was surprised to learn that some American and Continental friends took a very pessimistic view of nationalization. One eminent engineer asked "Why make changes in the winning team?" Mr. Nimmo replied that, by and large, the industry would be run by the same men, the only significant change being that of ownership.

Quality Control

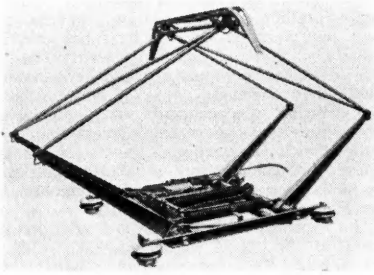
THE increasing use of statistical control of quality in production is creating a demand for books describing in a practical way all the available methods without serious reference to mathematical principles. A publication of this kind is BS.1313, entitled "Fraction-defective Charts for Quality Control," which describes the simplest and cheapest form of sampling, applicable not only to factories but also to stores, shops and offices. Following a brief explanation of principles, the first section contains instructions for the construction and use of the first control chart. The second section goes into more detailed recommendations for sample size and interval, control limits and practical suggestions. The third section introduces refinements to chart operation. Every method described is accompanied by one or more examples from actual practice and reproductions of actual charts. This document, price 6s. post free, is available from the British Standards Institution, 24, Victoria Street, London, S.W.1.

Metrovick Equipment for Holland

Traction Motors, Gears and Pantagraphs

IN connection with the rehabilitation of the system the Netherlands Railways have placed a contract with the Metropolitan-Vickers Electrical Co., Ltd., for the supply of traction motors, gears and pantagraphs for high-speed motor-coach stock.

The motors, rated at 235 h.p. on the one-hour rating, are of the normal box-frame axle-hung type and are self-ventilated. The line voltage is 1,350, and the motors are connected permanently in pairs in series; thus each machine, though insulated for 1,500 V, has only 675 V across its terminals. Field weakening is obtained by tapping the motor field. Axle bearings of either the sleeve or the roller type can be accommodated.



Metrovick pantagraph current collector

The gears, 556 sets of which are being supplied, have a ratio of 22/57 and will be of the resilient type in which a hardened ground pinion engages with a resilient gear wheel.

The current collectors (illustrated) are single-shoe pantagraphs, having an operating height range of about 8 ft and equipped with carbon contact strips. The single collector shoe has a contact pressure of 16 lb, constant throughout the whole of the height range. The shoe is supported by a spring-and-link system, which allows a little vertical movement independently of the main pantagraph structure to enable continuous contact to be maintained when sudden changes in height of the overhead wire occur. Upward and downward movement is closely controlled.

Although the pantagraph structure is rigid and strong the weight of the moving parts is very low, permitting a high upward acceleration to conform with the rapidly varying height of an overhead wire.

Electricity in Glass Making

SOME ways in which electricity is used in glass making were commented on by MR. P. C. BARNES (Pilkington Bros., Ltd.) in his address as chairman of the Mersey and North Wales Centre of the Institution of Electrical Engineers.

Motors ranged in size from clock types for instruments to those driving intermittent 1,500-h.p. grinders. The speed of rolling and drawing machines needed to be variable up to 15 to 1 so they usually had d.c. motors. A stoppage of less than a minute in the rolling process would cause the glass to solidify, resulting in many days' delay and the loss of special steel rollers by distortion or surface damage. Therefore those machines were provided with standby batteries and, in some special cases, duplicate motors.

Glass melting furnaces contained up to 1,300 tons; their refractories were cooled by water and air, the pumps and fans being normally duplicated and sometimes having stand-by batteries. The need for continuity of service was one of the reasons for the preference for private generation of electricity which still persisted. The grinding and polishing of plate glass was an excellent testing ground for electrical equipment, as it was normal to run about 155 hours per week at full load; the atmosphere was humid and laden with fine sand, so tropicalization of motors was desirable.

The justification for using electric resistance furnaces for making pre-stressed "toughened" plate glass was the precision of temperature control obtainable. An annealing tunnel, or lehr, had been operated in this country and proved to be quite satisfactory technically, but the small gain in control was out-weighed by the cost of electricity.

Mr. Barnes described various attempts to melt glass electrically, directly and indirectly, stating the reasons why they had failed. He then outlined the heat conditions in a continuous melting "tank" furnace, normally fired with producer gas in this country. Several practical electric conduction heating furnaces using carbon electrodes were in use in Europe, mainly in districts where hydro-electric power was available. The chief difficulties were avoidance of contamination and discoloration.

A consumption of 1,000 kWh per ton of glass produced was an excellent result and had been attained under good conditions. There would be a case for electric glass melting if the price of 1,800 kWh were equivalent to that of a ton of coal, although in this country at present the coal consumption actually involved was about the same for both methods.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Magnetic Amplifiers

A RANGE of comparator instruments embodying magnetic amplifiers of the linear variable gain d.c. type is now available from ELECTRO METHODS, LTD., 220, the Vale, London, N.W.11. One example is a photometer, the input impedance of which (in conjunction with barrier layer photocells) is used for colour comparison.

After setting the meter pointer to zero by the knob on the left, a known exciting "signal" is applied for calibrating the deflection as required

Amplifying magnetic colour photometer

by adjustment of the knob on the right. The value of the "signal" to be measured (provided by the photocells) will then be indicated by the meter pointer. Amplification is of the order of 12,000, which causes full-scale deflection with an input approximating to 0·02 μW, which corresponds to about 1 μA for the MAP·1 type instrument. The input impedance can be arranged to make use of exciting inputs provided by thermocouples, etc., instead of photocells. The instrument is mains energized at 230 V through a three-core connector.

Position Controllers

A range of position controllers for operating mechanisms over distances varying from a few yards up to a quarter of a mile has been developed by EVERSHED & VIGNOLES, LTD., Acton Lane, Chiswick, London, W.4. Each comprises a hand-operated transmitter electrically connected to one or more distant electric motors. Any movement of the transmitter handle causes a proportionate movement in each of the distant "slaves," which develop sufficient power to operate the mechanisms to which they are coupled. The system is suitable for the control of engine throttles, faceplate controllers, cooling louvres, valves and for tuning condensers at radio stations.

The transmitter contains a rotary switch which energizes in sequence three windings in the stator of the slave unit, thus causing its rotor to turn in synchronism with the transmitter. The slave motor can be stalled without harm and possesses neither commutator nor brush gear, so minimizing maintenance. The controller works within fine limits and a large movement at one end can be converted into a small one at the other, the relative speeds of the transmitter and slave being dependent on the gear ratio in the two units. There are various patterns of transmitter; some have a limited arc of travel, while other models permit continuous rotation in either direction. A dual rotary transmitter is also available, with twin transmitters operated by a single handle; a knob below each dial enables that particular unit to be disengaged mechanically and electrically should it be necessary to rotate one transmitter without the other. The d.c. controller may be wound to operate at from 20 to 50 V and needs from $\frac{1}{2}$ to 2 A depending on the voltage.

A further development ensures that two or more mechanisms which are separated either by distance or intervening equipment operate in synchronism.

Bed Lamp

In the "Dormez" bed-head reading lamp made by the ERALITE MANUFACTURING CO., 194, The Broadway, Wimbledon, London, S.W.19, light from the enclosed bulb enters a transparent hood edgeways through a central aperture and spreads outwards in one plane only. Rays that tend to escape on any other plane are reflected back by the polished hood to the opposite side where they are again reflected from the centre to the outside edge, which is moulded to a curved angle for directing the light on to the bed. Special ventilation is provided for the 40-W lamp and the aluminium frame is stove enamelled ivory.

Enclosed "Dormez" bed lamp

Cycle Lighting Set

A polished aluminium dynamo lighting set for cycles is announced by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2. This model "L" furnishes 0·5 A at 6 V and weighs 10 oz, being an improvement in respect of size upon the "Philidyne"

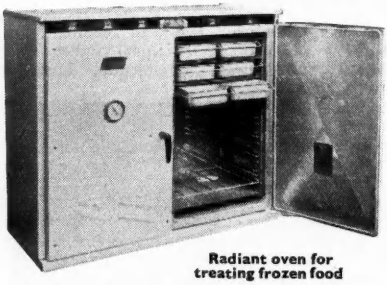
eight-pole type. The magnet is of "Ticonal" steel, the bearings are self-lubricating, the spindle is grease packed, and spring loading maintains the pressure of the driving pulley on the wheel tyre. The headlamp has a press stud for opening the hinged front and space is provided for a stand-by flat battery, the switch being on top; twin bulbs are fitted for main and dipped beams. The rear lamp has a plastic reflector, prismed internally with a smooth convex exterior. The bulb-holder slides out on a sprung tubular fitting for easier access.

Bed Warmer

The "Bedcomfort" heating pad which is marketed by S. B. JACKSON, LTD., Windsor House, Victoria Street, London, S.W.1, has been redesigned. It is rated at 30 W and regulated by a thermostat of the vacuum type so that the contacts, which have a 1 A at 250 V rating, cannot oxidize or be interfered with by moisture and dust. The blanket-covered pad measures 13½ by 18 in. and is fitted with an in-bed switch.

Treating Frozen Foods

A two-part combination oven and hot-cupboard for dealing with deep-frozen foods in aircraft and ships is being manufactured by the DULRAE MANUFACTURING CO. (Crittall group)



Radiant oven for treating frozen food

156, Great Portland Street, London, W.1. It is constructed mainly of corrosion-resisting aluminium alloy, being 35½ in. wide by 30 in. high and 17½ in. deep overall. It is divided into two equal parts, each 15 in. wide by 12 in. deep with separate side-hinged doors.

In the oven compartment are nine radiant heating elements of the flat plate type, arranged horizontally in eight shallow sections, each of the latter accommodating a rustless carrier bearing four aluminium food containers of equal size, so that the oven capacity is 32 containers. The average time needed for dealing with one full oven "charge," starting with the trays and their contents at zero Fahrenheit, is fifty minutes.

Four warming elements can be removed from the oven and placed in the adjoining compartment to enable dishes of larger dimensions to be treated separately in the top part of the hot-cupboard. In the lower section a single element is provided to maintain an inside temperature of 160 deg F to retain the warmth of dishes transferred from the oven.

Control of the elements in both compartments is by hand switches with thermal overload trips. Dial type heat gauges are fitted to the doors of the oven and hot-cupboard to warn the steward that the point at which the food has become unfrozen has been reached. Beyond this point the temperature rises very rapidly.

A thermostatic limit switch and pilot lamps are incorporated, the full loading being 3 kW.

A.F. Oscillator

The latest audio-frequency oscillator announced by MUIRHEAD & CO., LTD., Elmers End, Beckenham, Kent, is of the resistance-capacity tuned type D-105-A and is mains operated through a magnetic stabilizer and neon voltage regulator. It is due to Mr. E. R. Wigan, of the Signals Research and Development Establishment, Ministry of Supply, and its special feature is that the frequency of oscillation can be selected by means of four decade dials marked respectively in thousands, hundreds, tens and units.

This unusual system of tuning permits a fixed number of cycles per second to be added or subtracted with respect to any given setting, the interpolation accuracy over a limited frequency band being of an extremely high order. This characteristic is of much value in precise work, such as filter measurement, since it is only necessary to standardize the oscillator at one frequency within the filter band. The need for sub-divided scales and calibration charts is avoided, thus minimizing setting errors.

The range is very wide, extending from 1 c/s to over 100 kc/s; the low frequencies obtainable have been usefully employed in vibration measurements while the precision with which the audio and carrier frequencies may be selected and, if necessary, simply repeated is of particular importance to communication engineers.

Transparent-Cased Breather

A transformer breather containing silica gel, which differs from the usual metal-housed variety, has been announced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17. Its casing is made of transparent plastic material, so enabling the whole of the outer surface of the gel crystals to be readily inspected for change of colour; this indicates the need to reactivate the silica simply by heating. A central bolt holds the cylindrical container, which is less than 9 in. long, vertically to a diecast top cap into which the connecting pipe is screwed. At the bottom end of the casing is a labyrinth oil seal that permits air to come into contact with the gel only while breathing is actually taking place.

COMMERCE and INDUSTRY

Central Authority's Headquarters. Reduced Cinema Lighting.

THIS week the British Electricity Authority took over premises at Portland Court, 170a, Great Portland Street, London, W.1, as its headquarters. The telephone number is Museum 6844.

Economy in Cinemas

All members of the Cinema Exhibitors' Association were notified last week of arrangements made between the Association and the Ministry of Fuel and Power for substantial reductions in interior and exterior lighting between October 20th and March 31st next. They were also warned that if the winter weather was very severe it might be necessary to reduce the hours of opening.

Royal Society of Arts

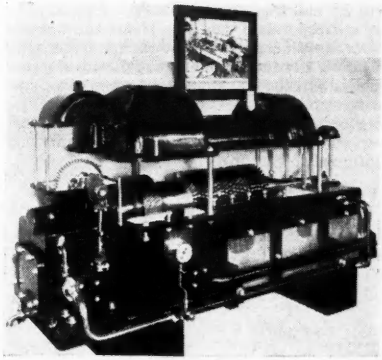
Princess Elizabeth, the newly-elected president of the Royal Society of Arts, will visit the Society's House on November 5th, to preside at the opening of the 194th Session. An inaugural address entitled "Cultural Relations within the British Commonwealth" will be delivered by the chairman of the Council, Sir Harry Lindsay, Director of the Imperial Institute. The occasion will also be marked by the re-opening by Her Royal Highness of the Society's Lecture Hall, which was badly damaged during the war.

Welding Research

The annual report of the British Welding Research Association indicates past work and that which is in progress; the constitution of the Council, Board and committees; and publications. The campaign launched during the previous year had the effect of raising the membership from 43 to 133 and the income by nearly 50 per cent, including an enlarged grant from the D.S.I.R. Although contributions to the research funds have grown, the total available for expenditure has been insufficient to carry out the desired programme and to maintain the level of payments to other research bodies. Such allocations had consequently to be substantially reduced and the programme revised.

Historic Machine

Through the generosity of a Tyneside firm another historic machine has been presented to the Science Museum, South Kensington, London. This machine is the first commercial axial-flow turbo-blower and was constructed by C. A. Parsons & Co., Ltd., at their Heston Works, Newcastle-upon-Tyne in 1901. It was supplied to the Cookson Lead & Antimony Co., Ltd., Howden Lead Works, Willington Quay-on-Tyne. The machine was required to supply the blast for a lead-smelting furnace, its duty being to deliver 3,000 cu ft of free air per minute at a gauge pressure of $1\frac{1}{4}$ lb per sq in. The blower is of the bladed type consisting of 20 pairs of rows of blades $1\frac{7}{8}$ in. high on a shaft diameter of $9\frac{5}{8}$ in. It operated at a speed of 4,000 r.p.m. and was driven by a continuous current motor of 50 h.p. The machine was in continuous service till 1916 and thereafter was used as a standby until finally dismantled in 1937. The accompanying picture shows the



The first commercial axial-flow blower, presented to the Science Museum

arrangements which have been made for the cover to be permanently lifted so that the internal blading can be examined. Enlarged photographs of a modern gas turbine mounted on the cylinder cover enable a comparison to be made with the present-day type of axial-flow compressor. The complete blower was given to C. A. Parsons & Co., Ltd., by the Cookson Lead & Antimony Co., Ltd., for presentation to the Science Museum.

Brush Electric Vehicle Shows

A series of small exhibitions of the latest types of Brush electric vehicles is now being held in various parts of the country. After successful shows at Maidenhead, Taunton, Newton Abbot and Plymouth, last week a display was arranged at the Woodcote Motor Company's showrooms at Epsom to which about three thousand representatives of dairies, bakeries, stores, etc., were invited. Special interest was shown in a new streamlined 10-14 cwt coachbuilt van with an exceptionally capacious body (144 cu ft) especially suitable for the delivery of food, and there were various

examples of the 18-22 cwt vehicle which has been proving successful in hilly districts and of which the Royal Arsenal Co-operative Society has just placed an order for a fleet of fifty. An opportunity was also given to inspect the company's new industrial truck available in both fixed and elevating platform models. It has a turning circle of only 6 ft and a conservative rating of 2 tons. All operations are carried out from a comfortable driving seat. Examples of the company's battery charging equipment were also to be seen. Next week a similar display is to be given in Bristol, followed by other exhibitions in Gloucestershire.

European Power Supply

Last week the committee on electric power set up by the Economic Commission for Europe held its first session in Geneva. According to the correspondent of *The Times* the subjects under consideration included the interchange of power between Poland, Czechoslovakia and Austria and the existing arrangements by which Switzerland supplies power to most of her neighbours. It was noted that the demand everywhere was in excess of the supply and continued to increase.

Egyptian Import Plan

The Egyptian Import Commission announces that the following articles will be imported into Egypt between now and the end of the year: Generators and motors (£E30,000), batteries and parts (not pocket) (£E15,000), electric sets and parts (£E30,000), electric lamps (£E50,000), radio equipment and telegraph apparatus (£E20,000), signalling apparatus (£E1,000), electro-medical apparatus (£E20,000), electric cables (£E100,000), insulated electric wire (£E40,000), and other electrical apparatus and parts (£E220,000).

Fire Protection Association

The Fire Protection Association has been formed by the members of the Fire Offices' Committee. Whilst that body is an organization of the leading British insurance companies, the Association has no purpose to serve which is in any way connected with the business of insurance. Its purpose is to reduce national fire wastage, and it is concerned exclusively with the giving of technical advice and assistance. The Association has in existence a nation-wide, free, fire protection and prevention advisory service. It is distinct and entirely apart from the Department of Scientific and Industrial Research, although the insurance companies who have created the Association are closely allied with the Department in fire research. Those wishing to become associate members can obtain particulars from the Fire Offices' Committee Fire Protection Association, The Testing Station, Boreham Wood, Elstree, Herts.

Generation of Electricity in September

Returns to the Electricity Commissioners show that 3,150 million kWh was generated (2,968 million sent out) by authorized undertakings in Great Britain during September last, compared with 3,105 million kWh in September, 1946, representing an increase of 1·4 per cent.

Up to the end of September 30,439 kWh was generated (28,711 million sent out) compared with 29,199 million kWh for the corresponding period of 1946, representing an increase of 4·2 per cent.

General Radiological, Ltd.

Mr. J. Cayley Mann, the managing director, and Mr. C. N. Rocky, technical director, of General Radiological, Ltd., who have been connected with the company since its formation in 1924, have, in association with the Industrial & Commercial Finance Corporation, Ltd., acquired the shares vested in the Custodian of Enemy Property at the outbreak of war. Mr. Cayley Mann and Mr. Rocky will act as joint managing directors, and Sir Wilfred G. Lindsell. is chairman. The Industrial & Commercial Finance Corporation, Ltd., has, in addition agreed to subscribe for 40,000 £1 5 per cent preference shares.

City Livery Companies

In the report of the talk given by Mr. E. P. Angus at the recent luncheon of the Batti-Wallahs' Society on the Livery Companies of the City of London (October 3rd issue), we referred to the contributions made to the City & Guilds of London Institute by the Clockmakers' Company. This should have read the Clothworkers' Company, which has contributed over £300,000 to the Institute.

Employment in July

The September *Ministry of Labour Gazette* contains statistics relating to employment in various branches of industry and commerce during July. Figures relating to the electrical industry are extracted in the table below

EMPLOYMENT DURING JULY (THOUSANDS)

Branch	Males (14–65)			Females (14–60)			Total		
	Mid-1939	Mid-1946	July 1947	Mid-1939	Mid-1946	July 1947	Mid-1939	Mid-1946	July 1947
Electrical engineering ..	105·9	99·9	105·9	28·0	53·2	50·6	133·9	153·1	156·5
Electrical wiring and contracting	38·9	45·5	47·2	2·8	5·5	5·6	41·7	50·9	52·7
Electrical apparatus, cables, lamps, etc.	116·4	117·4	139·7	79·5	126·8	132·3	195·9	242·2	272·0

and compared with those a year earlier before the war.

Unemployment in Great Britain in the three branches on August 11th was as follows:—Electrical engineering, 1,740 (489 women); electrical wiring and contracting, 1,064 (45 women); and electrical apparatus, cables, lamps, etc., 2,702 (1,189 women).

New Glassware Plant

Chance Brothers, Ltd., of Smethwick, have installed a new automatic plant for the production of machine-made pressed and pressed and blown domestic and lighting glassware. The new furnace is now operating and is being used to manufacture domestic and lighting glass primarily for the export market. The domestic glass being produced is designed to replace that previously imported from Belgium and Czechoslovakia, and it is expected that these new British products will compete successfully with similar foreign types in all export markets. Particular attention has been paid to design and the company has employed well-known designers, such as Mr. R. Y. Goodden and Mr. E. M. Dinkel.

Education in Industry Conference

The annual conference of the British Association for Commerical and Industrial Education was held at Ashridge College, Hertfordshire, from October 3rd to 6th. The subject of the conference was "Co-operation through Education" and amongst the speakers were Lt. Gen. Sir Ronald Weeks (Vickers and the English Steel Corporation), Dr. P. Dunsheath (W. T. Henley's Telegraph Works Co.), and Major W. F. F. Scott (Tube Investments). The outstanding points brought up at this conference were how to provide education for the unskilled majority of employees; how to plan for the education and training of the skilled minority; and how to achieve full co-operation between the planners of industry, within individual concerns, and the local or central authorities for education.

Strike at Reyrolle Works

Last week about a thousand time workers, including storemen, crane operators and labourers, at the Hebburn-on-Tyne works of A. Reyrolle & Co., Ltd., ceased work in an attempt to enforce a claim for a 27½ per cent "incentive bonus" to reduce the difference between their pay and that of piece workers. The company stated that the strike was unconstitutional and it intended to abide by agreements with the trade unions. The claim was one for higher wages regardless of circumstances or the means of measuring effort.

Later, three thousand piece workers refused to handle materials brought to the work benches by other workmen who volunteered to take the places of the strikers. They attended for work, but would only do jobs for which material was already at hand. They refused to do the work normally done by the time workers.

The time workers contended that working for men on piece rates kept them fully occupied and they should therefore receive a bonus as well as the piece-work men. It was alleged that in some cases piece-work men were receiving as much as £14 a week, while time workers working with them received only £3 to £4. It was stated to be at least eighteen months ago that the claim for a bonus was put forward. The company insisted on a resumption of work before the matter could be discussed. The strikers offered to resume if the company accepted the principle of a bonus.

Power Station Colliers

In their annual report covering the year ended March 31st last, Stephenson Clarke, Ltd., mention that Coastwise Colliers, Ltd., in which they have an interest, is substantially increasing its fleet for the purpose of carrying coal for the power stations operated by and under construction for the County of London Electric Supply Co., Ltd.

Sales Conference

Delco-Remy-Hyatt (Division of General Motors, Ltd.) recently held a two-day sales and service conference of head office and outside sales staffs, when a comprehensive range of subjects was covered. The conference was opened by Mr. W. A. Crewe (general manager). Mr. C. H. Charles (general sales manager) gave encouraging comment on the results achieved by existing products, and gave details of some new products to be available in the near future. The second day was spent at Stag Lane Works of the company, where a study of servicing problems was supported by a film show and comments from technicians.

Chain-Grate Stoker Film

A sound film showing the chemical and physical principles underlying the combustion of coal and their application to the chain-grate stoker has been made by Verity Films, Ltd., for Babcock & Wilcox, Ltd. Animated diagrams illustrate how heat, represented by calorific value (used as the basis for calculating boiler efficiency), is liberated and distinguish between the theoretical and practical quantities of air required for complete combustion.

Optimum operating efficiency is shown to require a balance between maximum heat liberation in the furnace and minimum chimney loss. Curves representing the various boiler losses are integrated and then inverted to give the efficiency curve. The evolution of a natural-draught chain-grate stoker to a modern balanced-draught unit is revealed by diagram build-up with shots inside the furnace to illustrate different combustion conditions. The application of the chain grate to shell boilers is also shown.

After a discussion of combustion problems and means available for solving them, the film ends with shots of a combustion engineer co-ordinating the data required for ascertaining the efficiency of his plant and emphasizing that efficient operation is necessary as well as efficient design. The film, which takes twenty-five minutes to show, is available free of charge, on application to any Babcock & Wilcox branch office, in either 35 or 16 mm size, the latter requiring projectors to accommodate a 1,600-ft spool 14 in. in diameter.

Dispute Over 5½-day Week

At a meeting last week the trade union members of the North West Joint Industrial Council for the electrical industry decided to urge the power station maintenance men in Manchester and other towns to withdraw their threat regarding Saturday work and to accept the recent 44-hour working week of five and a half days. The unions undertook to deal with the claim for a five-day week through the normal channels.

New Fuel Minister's Warning

Mr. Hugh Gaitskell made his first public statement as the new Minister of Fuel and Power at a regional conference at the Mansion House, London, on Monday last. He said that supplies of coal to industry could not be cut further without doing grave harm to production and nullifying the Government's appeal for longer hours of work and extra effort. While measures could be taken to control the supply of coal to domestic consumers it had been found impossible to ration domestic gas and electricity and it was necessary to urge the public to exercise the utmost economy and also to keep consumption down during the peak periods.

Atomic Research

Although high priority was accorded in October, 1945, to the construction of an atomic-energy research establishment at Harwell, evidence submitted to the Select Committee on Estimates (Stationery Office, 6s. net) showed that the site work (which started in May, 1946) was about six months behind schedule.

The programme provided for the construction of two piles. One of low power, intended to be in operation this year, for carrying out experiments relating to the nuclear properties of elements, will consist of pure graphite into which is inserted a small percentage of uranium, the whole surrounded by a thick concrete shield. The second (due for commissioning next summer) will provide information required for the development of heat and power and the production of radio-active materials. Apparatus has also been set up to separate the stable isotopes of several elements, and three mass spectrographs are being used on behalf of the Medical Research Council.

For nuclear research generally, a 5-MV high-pressure machine is now under test and a cyclotron is being built to produce high-speed protons and neutrons having energies equivalent to 140 million electron volts. Laboratories are under construction for work in radio-active chemistry, metallurgy, medical research and chemical engineering.

Contract Price Adjustment Formulæ

The British Electrical and Allied Manufacturers' Association informs us that the following are the latest figures for use in its contract price adjustment formulæ:—Rate of pay for adult male labour, October 11th, 110s. (no change). Board of Trade figure for intermediate products, October 11th, 227·2 for September (against 226·9 for August).

Women's Conference

There is to be a three-day conference for senior demonstrators and saleswomen held jointly by the E.A.W. and E.D.A. at the Caxton Hall, Westminster, S.W.1, from October 22nd to 24th. Mr. H. F. Carpenter, chairman of E.D.A., will open the conference and there will be an address by Lord Citrine. Other speakers will include Dame Caroline Haslett and Mr. V. W. Dale.

Trade Publications

Siemens Electric Lamps & Supplies, Ltd., 38, Upper Thames Street, London, E.C.4. Priced list (No. 667, edition 7) of "Siemax" and "Full O' Power" batteries for radio, hearing aids, pocket torches and cycle lamps.

Steatite & Porcelain Products, Ltd., Stourport-on-Severn, Worcs.—Three leaflets on radio ceramics: No. 29 on coil formers and inductors, No. 30 on stand-off and aerial insulators and No. 31 on metallized bushes.

Trade Announcements

Elton, Levy & Co., Ltd., have removed to 1-4, St. Ermin's (West Side), Caxton Street, London, S.W.1 (telephone: Whitehall 9621).

New Day Electrical Accessories, Ltd., has removed to P.A.M. Works, Merrow, Guildford, Surrey.

Thos. W. Ward, Ltd., have formed a Belgian subsidiary with the title of Société Thos. W. Ward (Belgium), Société Anonyme, with offices at 8, Longue rue des Claires, Antwerp.

Royal Signals Old Comrades

A "reunion smoker" for Royal Signals is being organized by the newly formed London Branch of the Royal Signals Old Comrades' Association to be held on October 18th. Headquarters of the London Branch are at 206, Brompton Road, and the honorary secretary is Mr. J. Boyd, 10, Cyprus Road, N.3.

Induction-Motor Heating

Current-Time Characteristics under Abnormal Conditions

By K. S. Kuka

TO protect a motor from overheating, it is necessary to decide what constitutes an excess temperature. For long periods 90 to 100 deg C is satisfactory. For "A Class" insulation, the maximum safe temperature of the copper conductor is fixed at 110 deg C, i.e., in an ambient temperature of 40 deg C copper operates safely at 70 deg C above the ambient.

However, where high temperatures are transient and infrequent a greater rise can be permitted, e.g., when a motor stalls or is started directly on line, though unless specially designed it should not be called upon to withstand such conditions frequently. A total temperature of 170 deg C under short-circuit conditions can be allowed occasionally, for a few seconds only, as the upper limit for motor stator copper. This is, of course, not the limit for insulated copper; but where the wire is selected for its continuous current-carrying capacity, its resultant temperature under short-circuit conditions can be taken to be as stated above.

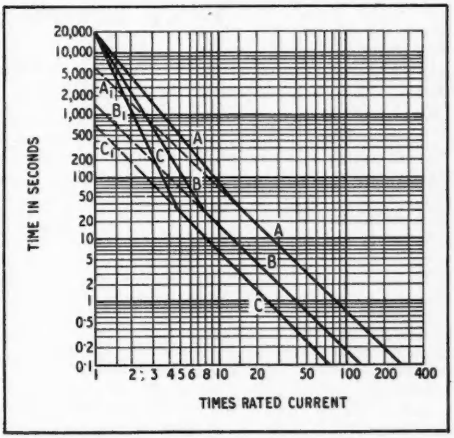
In a normal induction motor, running at its rated load, one-third of the total heat loss is due to the iron and two-thirds to the copper. If, however, the motor stalls and takes five times the current, the iron loss remains constant but the copper loss increases twenty-five times. Under these conditions the iron temperature can be assumed to be stationary, while the copper reaches its limit.

The accompanying graph shows the current-time characteristics of an induction motor, giving an overall picture of the motor heating from continuous full load to heavy short circuits. The curves, drawn on a log-log scale, are based on a current density of the stator copper of 1,000 to 3,000 A per sq in. when the machine is carrying the rated full-load current. They are calculated on the following basis:—

It is assumed that before the overload is applied, the temperature of stator copper is 70 deg C; the maximum limiting total temperature to which the copper is allowed to go under overload or short-circuit conditions is 170 deg C. For periods of 30 seconds or less, no heat is supposed to be dissipated, i.e., all the generated heat remains concentrated in the copper.

Under full-load conditions the copper reaches its specified temperature in about 20,000 sec.

The current-time curve is calculated on the basis of the following equation:



Heating characteristics of three-phase induction motors Current-time curves for copper, showing rate of heating for fixed current densities at rated current and maximum temperature rise of 100 deg C. Curve A—1,000 A per sq in.; Curve B—2,000 A per sq in.; Curve C—3,000 A per sq in.

$$I = 0{\cdot}22 \times 10^6 \times A \times \sqrt{\frac{1}{t} \log_{10} \frac{(Q2 + 234)}{(Q1 + 234)}}$$

where I = current in amperes, A = cross-section of stator conductor in sq in., Q1 = initial temperature of conductor in deg C and Q2 = final limiting temperature of conductor in deg C. For Q1 = 70 and Q2 = 170, we have $t = 6{,}000 \times 10^6 \times \frac{(A)^2}{(I)^2}$.

Each curve is shown to have one slope between 20,000 and 30 sec and another between 30 sec and 0·1 sec. The point at 20,000 sec shows that the motor carrying its full load continuously will reach its specified temperature within that time. If at that point the motor is overloaded, its temperature

goes on increasing until it reaches 100 deg C rise. Up to 30 sec the heat generated in the copper tends to be dissipated, depending on the current and the period for which it is allowed to flow. Thus the temperature rise of the motor copper will reach 100 deg C, i.e., 170 − 70 deg, if about eight times the full-load current is allowed to flow for 30 sec in a winding designed for a current density of 2,000 A per sq in. The curve between 20,000 and 30 sec gives the permissible overload-time condition of the stator.

Below 30 sec all the heat generated remains concentrated in the copper, which thus gives a different slope. The dotted part of the curve shows the current-time relationship from 30 sec upwards if no dissipation of heat is considered and is obtained from the above equation. Thus the curves between 20,000 and 30 sec give permissible current-time relationship for overload conditions, while those between 30 and 0·1 sec give the current-time relationship under short-circuit.

The curves give a good working method of correlating the copper thermal capacity on the basis of the current density used for the motor design. The values obtained are conservative and are sufficiently close for all practical purposes. They can be gainfully utilized to decide the starting and stalling limits of the motor in relation to its protective equipment.

Next Week's Events

Monday, October 20th

LIVERPOOL. — Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Electrical Control of Dangerous Machinery and Processes," by W. Fordham Cooper.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Address by V. Z. de Ferranti (past-president).

LONDON.—St. Ermin's Hotel, 6 p.m. Association of Supervising Electrical Engineers (Central London Branch). "Electric Water Heating," by P. Honey.

LONDON.—Institution of Electrical Engineers, Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Chairman's address on "Radio Wave Propagation," by E. M. Hickin.

BRISTOL.—I.E.E. Bristol Students' Section, 7 p.m. Visit to the Burden Neurological Institute, Stoke Lane, Stapleton, Bristol.

BIRMINGHAM.—Grand Hotel, 6.30 p.m. Birmingham Electric Club. "Multi-Broadcast Carrier-Frequency Radio Relay," by A. R. Almond.

Tuesday, October 21st

DERBY.—Electricity Showrooms, 6.30 p.m. I.E.E. East Midland Centre. "The British Grid System in Wartime," by J. Hacking and J. D. Peattie.

CAMBRIDGE.—Cambridgeshire Technical College, 6 p.m. I.E.E. Cambridge Radio Group. Chairman's address by R. W. Wilson.

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "Ultra-high-speed Relays in the Fields of Protection and Measurement," by W. Casson and F. H. Last.

STAFFORD.—At the English Electric Co., 6.15 p.m. I.E.E. South Midland Centre. Report on "The Practical Training of Professional Electrical Engineers." To be presented by D. B. Hoseason, a member of the Joint Committee on Practical Training in the Electrical Industry.

LONDON.—L.T.R. Headquarters Refreshment Club, Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers (London Centre). Informal meeting. "Engineering Control Statistics—Some Difficulties and Possible Solutions," by W. H. Scrivener.

Wednesday, October 22nd

LONDON.—Institution of the Electrical Engineers (Transmission Section), 5.30 p.m. Chairman's address by Prof. W. J. John.

MANCHESTER. — Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. "New Possibilities in Speech Transmission," by Dr. Ing. D. Gabor.

BRISTOL. — Merchant Venturers' Technical College, 6.30 p.m. I.E.E. Western Transmission Group. Chairman's address by S. Hoggart.

Friday, October 24th

LONDON.—Institution of Mechanical Engineers, 5.30 p.m. Presidential address by Lord Dudley Gordon.

LONDON.—39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. "The Willans Engines," by Cdr. K. W. Willans.

LONDON.—Café Royal. Electrical Trades' Commercial Travellers' Association. Annual dinner and dance. Tickets price 25s., can be obtained from Mrs. S. Johnson, 6, The Firs, Westwood Road, S.E.26.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Fabricated Methods of Oil Engine Construction," by J. Botwright.

Institute of Fuel Conversazione

The Council of the Institute of Fuel has announced that, in view of the existing national circumstances, the autumn conversazione, which was to have been held at the Connaught Rooms, will not now take place. It is hoped that it will be possible to hold the Institute luncheon at the Connaught Rooms on April 22nd, 1948.

ELECTRICITY SUPPLY

Torquay Inquiry. Irish Project Completed.

Anglesey.—MENAI STRAITS SCHEME.—The County Council has been informed by the Ministry of Fuel and Power that its views and those of the Beaumaris Corporation and Menai Bridge U.D.C. will be carefully borne in mind when further consideration of the hydro-electric development scheme is practicable. The scheme, submitted by Mr. F. O. Harber, borough electrical engineer of Bangor, provides for the utilization of the tidal waters of the Menai Straits. Both the Beaumaris and Menai Bridge authorities objected on the grounds that the project would be detrimental to navigation.

Barrow-in-Furness.—HYDRO-ELECTRIC POSSIBILITIES.—On the occasion of the recent inspection of the electricity undertaking in the rural area the borough electrical engineer (Mr. J. E. Shepherd) told members of the Council that the three hydro-electric schemes on which the consulting engineers had reported would be capable of generating 132 million kWh a year. This represented a saving of 100,000 tons of coal, costing £250,000. Among those present on the occasion of the visit was Mr. H. R. Burnett, borough electrical engineer from 1898 to 1938, who spoke of the early days of the undertaking.

Bootle.—SODIUM LIGHTING.—The Ministry of Transport has approved a scheme for lighting Hawthorne Road, Regent Road and Shore Road by sodium lamps.

Cheltenham.—SUBSTATION TELEPHONES.—At the monthly meeting of the Borough Council, on October 6th, it was decided to install private automatic telephones in the major distribution substations, to be operated from the head office exchange, making use of existing spare pilot cables.

CHANGE-OVER.—In continuation of the policy of replacing the 2,000-V single-phase a.c. system by extending the 11,000-V and medium-voltage networks, it was decided to make application to the Electricity Commissioners for a loan of £14,500 for the change-over in the Lower High Street area.

Darwen.—ELECTRICITY DEPARTMENT'S LOSS.—The loss of £4,550 on the past year's working of the electricity undertaking is attributed to coal shortage and bad weather.

Huddersfield.—LOANS SANCTIONED.—Consent has been received to the following loans: £11,234 for mains, £1,718 for substations, £13,269 for the conversion of part 1 of the 33-kV distributing system and £35,000 for mains and services.

Ipswich.—TRANSMISSION SCHEME.—The Corporation Electricity Committee has been authorized by the Council to augment the 33-kV transmission scheme at Whitton, and to erect a further primary substation, together with certain secondary 11,000-V and 6,000-V equipment, at a total cost of £105,610. Application is being made to the Electricity Commission for the necessary loan sanction to meet this expenditure, and also for an expenditure of £7,295 which will be necessary at Wherstead Road substation to replace inadequate switchgear by modern 250-MVA equipment.

Liverpool.—LOANS.—The Electric Power and Lighting Committee has received sanction to borrow £153,750 for extensions to the distribution system, £100,000 for mains, substation buildings and equipment, and £21,855 for the purchase of the plant and switchgear at three war factories in East Lancashire Road.

Nottingham.—LOWER FLAT RATE PROPOSED.—The Electricity Committee recommends that the lighting flat rate shall be reduced from 3¾d. to 3½d. per kWh.

Penmaenmawr.—REDUCED CHARGES. — The Urban District Council is reducing its electricity charges as follows:—Lighting by 1d. per kWh; two-part tariff to ⅞d. per kWh; and meter rents by 50 per cent, except in the case of sub-meters installed for consumers' benefit.

Peterborough.—SUBSTATIONS.—Sanction has been obtained by the Electricity Committee to provide substations at Farcet (£5,988), Glinton (£10,189) and Werrington (£4,343) and also to supply electricity to Glinton modern secondary school (£1,457).

Poplar.—HIGHER CHARGES.—If the Electricity Commissioners consent, the undertaking is to raise its charges after the December meter readings. The lighting flat rate will go up from 6d. to 6½d. per kWh and under the domestic rate the charge per kW of lighting installed is to be increased by 9s. to £4 10s. a year. Other revisions include an increase in the business and commercial fixed charge from £14 8s. to £16 per kW of lighting installed and from 11s. to 12s. per kW for heating. Power tariffs will also be advanced, and the charge to the Fixed Price Light Co., Ltd., will be increased to £5 15s. 6d. a year per kW installed.

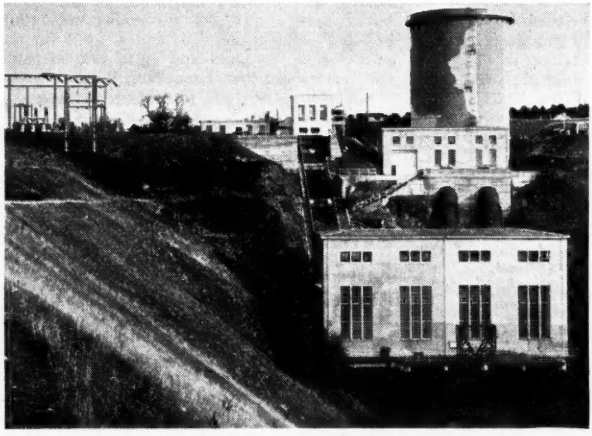
Salford.—SCHOOL LIGHTING.—The Corporation is to install electric lighting at the Marlborough Road Schools (£2,415).

Scotland.—ANOTHER DISTRIBUTION SCHEME.—The North of Scotland Hydro-Electric Board has published a distribution scheme for Seil, Luing and Easdale which will provide power for the slate quarrying industry of the islands. The scheme consists of transmission lines from Clachan Bridge to Toberonochy, with branches to Ardencaple House, Balvicar, Ellanbeich, Easdale and Cullipool. Power will be provided

by the Grampian Electricity Supply Co. Overhead lines will span Clachan Sound and Cuan Sound.

The Electricity Commissioners have approved the scheme on the Board's assurance that it will proceed with it in stages after having received the Commissioners' financial sanction for each stage. The Board will extend supplies as soon as financial authority can be obtained and materials are available.

Scunthorpe. — DISTRIBUTION SCHEME. — The first stage of an important distribution development scheme which will ultimately involve a capital expenditure of £386,000 was recently approved by the Council. It was decided to apply for sanction to borrow £150,000.



Poulaphouca hydro-electric station

Torquay.—OVERHEAD LINE INQUIRY.—Mr. A. D. Erskine (Ministry of Fuel and Power) conducted an inquiry at the Town Hall recently into an application by the Corporation for permission to erect a high-voltage overhead line. The greater part (over three miles) would be in the area of the Newton Abbot R.D.C., which did not object, but 750 yards would pass over land of the Newton Abbot U.D.C. which claimed that it would seriously interfere with its development plans. For the Corporation it was contended that in present circumstances it would be many years before the land, which was low-lying, could be made ready, and it would be unreasonable to expect the Corporation to lay underground cables at an increased cost of £3,450. Mr. G. J. Hollyer, borough electrical engineer, referring to a criticism that Torquay had taken care that the last 75 yards of the cable at St. Marychurch should be underground, pointed out that the district was already built up. Mr. E. S. Evans, clerk to the U.D.C., spoke of housing and school plans in the vicinity, and said he was satisfied from applications received for the industrial site that it would be completely developed very rapidly. The Inspector afterwards visited the site.

Worthing.—DISCOUNT FOR CONSUMERS.—The Corporation is reducing electricity charges by allowing a discount of 10 per cent in each of the third and fourth quarters of the 1947-48 financial year.

Overseas

Eire.—LIFFEY SCHEME COMPLETED.—The River Liffet hydro-electric scheme was completed recently by the commissioning of the Poulaphouca generating station about twenty-five miles from Dublin. The plant there comprises two English Electric 25,300-h.p. vertical feathering propeller water turbines and generators running at 300 r.p.m. for a maximum head of 154 ft. The other station of the scheme is at Golden Fall, where one 6,400-h.p. vertical reaction water turbine and generator running at 187·5 r.p.m. for a maximum head of 58·5 ft, was completed a few months ago.

France.—PROJECTS TO CONTINUE. — The Paris correspondent of *The Times* says that it has been announced that the installation of plant at the Genissiat hydro-electric works, on the Rhône, is to proceed according to schedule in spite of the economic situation, and work on the sixty barrages now under construction will not be interrupted. It has also been decided to continue electrifying the Paris-Lyons line.

Switzerland.—POWER SUPPLIES CUT.—Because of the long drought in the summer the level of rivers and reservoirs is considerably below normal. In view of the effect of this on power production a 10 per cent cut in electricity supplies has been imposed as a preliminary measure. Electric heating has been banned.

E.I.B.A. Ball

IT is now confirmed that the Annual Ball of the E.I.B.A. at Grosvenor House will be held on November 14th. An attractive programme has been arranged. Billy Ternent and his orchestra will provide the music, and the cabaret is to include Sylvia Welling, Sherkot, the Eccentric, and the Three Avalons. Applications and cheques for tickets at 30s. each, should be sent to the Association, 32, Old Burlington Street, London, W.1.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Ferranti, Ltd.—The accounts for the year ended June 30th last show a trading profit, after tax, of £171,153, an increase of £55,074 on 1945-46. After providing £38,000 (£35,000) for depreciation, £3,555 (£4,072) for directors' fees, and £24,305 (nil) for deferred repairs, the net profit amounts to £105,293 (£77,007). General reserve receives £60,000 (£40,000) and the ordinary dividend, at 6 per cent tax free, is the same as last year, leaving £67,507 (£59,464) to be carried forward. A consolidated statement shows trading, etc., profits (after tax) of £214,321 (£147,493), current assets amount to £2,724,973 (£2,421,365) with current liabilities at £1,566,289 (£1,542,876) and reserves and surplus £1,004,128 (£904,295).

In his statement which accompanies the report and accounts, Mr. V. Z. de Ferranti (chairman and managing director) says that during the year the output of the commercial departments has been doubled. All departments have contributed to this increase, both those producing transformers, electricity house-service meters and instruments for the electricity supply industry, and those producing radio, television, domestic electrical appliances and clocks for the general public. One third of this output has been exported. Of their unexecuted orders for the electricity supply industry, 48 per cent are for the overseas market. The total volume of export orders shows an increase of 2¾ times over that of the last year before the war. There has been more re-arrangement of manufacturing facilities, and in particular the giving up of a requisitioned factory in which they made valves and cathode ray tubes, this department being moved to Moston. Development work on radar navigational aids and certain applications of electronic devices to industry have been concentrated in the Edinburgh factory. They are now faced with further re-arrangements as the result of the concentration on heavy plant at the expense of electrical appliances for the public. Considerable capital expenditure will be involved to deal with the increasing demand for heavy plant. The company is building a new transformer factory and a new foundry. The Canadian company increased its output by 40 per cent over the previous year.

General Gas & Electricity Co., Ltd.—Referring to the company's policy of disposing of its investments in gas undertakings provided suitable alternative investments could be obtained, the chairman (Mr. Arthur Collins) stated at the annual meeting that they had acquired on favourable terms the whole of a business engaged in the manufacture of electric wire and cable. Their manufacturing interests were now centred in the Clifton Securities Co., Ltd., which operated their gas and electrical manufacturing businesses in two separate divisions. The result of the year's trading of the electrical manufacturing division was very satisfactory. It had a full order book and new steam-raising plant, using unrationed fuel, was just about to be started up. A scheme was just being completed which would enable materials from the sterling area to be substituted for certain dollar-area materials.

Metal Industries, Ltd.—At the annual meeting held on October 7th Sir J. Donald Pollock, Bt. (chairman) said that during the year their electrical group was handicapped during the fuel shortage period and by continued difficulties in obtaining materials. Brookhirst Switchgear, Ltd., had been engaged throughout the year in a substantial reorganization of production, which was making good progress, and in consequence its accounts showed only a small profit for the year and it did not declare any dividend. On the other hand the Igranic Co. declared an increased dividend, and the electrical group as a whole provided dividends almost equal to those of the preceding year.

The Dubilier Condenser Co. (1925), Ltd., held its annual meeting on October 7th, when Mr. W. H. Goodman (chairman) said that up to the end of 1946 their total output rose to a level that could be considered satisfactory with the labour available, but subsequently the stoppages in production arising from fuel shortage and power cuts partially dissipated the advantages gained from the increased mechanization. Outstanding orders were larger than ever before under peacetime conditions. On the other hand, several customers had recently cancelled or suspended their contracts as they had had to modify their production programmes to meet the present abnormal circumstances which were affecting industry generally.

Electric & Musical Industries, Ltd., reports a net profit for the year ended June 30th last of £115,500, as compared with £165,000 for the preceding year. The dividend on the ordinary stock for the year is maintained at 6 per cent, but no bonus is paid (against 2 per cent).

C. A. Parsons & Co., Ltd., have announced an interim dividend of 5 per cent, less tax, on the ordinary capital. The company was made public in May last and the directors anticipated in the prospectus an ordinary dividend of 12½ per cent, less tax, for the current year.

Eastern Telegraph Co., Ltd.—In the Vacation Court on Saturday counsel on behalf of Mr. Auston Kavanagh, acting for a group of preference stockholders, applied for an injunction to restrain payment of any dividend on the

ordinary stock of the company out of the general reserve fund or otherwise than out of current revenue. The writ was issued and an order made on an ex-parte application for leave to serve notice of motion with the writ returnable to-day (Friday).

The Madras Electric Supply Corporation, Ltd., reports a net revenue for 1946 of £116,858, against £161,140 for 1945. To this are added dividends and transfer fees, making £128,189 (£173,253). Tax absorbs £47,404 (£42,446), but there is no provision for depreciation and renewals (against £50,000). After meeting other charges the net profit is £74,976 (£74,799). The ordinary dividend is reduced from 8 to 5 per cent and £91,391 (£57,715) is carried forward. The Madras Government has taken over the Corporation and the chairman, in his statement, says that the terms provided for the payment of £1,000,000 on account on the date of handing over in August.

A. Reyrolle & Co., Ltd., who recently raised their authorized capital to £2,000,000, are to issue 800,000 4 per cent cumulative redeemable preference £1 shares at 20s. 6d. each. Subscription lists will open and close on October 20th and preferential consideration will be given to applications by existing stockholders, employees and customers if made on the special forms provided.

The Cables Investment Trust, Ltd., reports a net profit for the year ended June 30th last of £169,484, as compared with £140,548 for the preceding year. The final ordinary dividend is unchanged at 3 per cent, again making 5 per cent for the year, and £390,386 is carried forward (against £325,402 brought in).

Max Stone, Ltd., propose to pay a final ordinary dividend of 20 per cent (against 25 per cent), making 40 per cent (same) for the year ended June 30th last. The net profit was £126,147 (£115,079) before providing £75,000 (£85,750) for taxation.

Rd. Johnson, Clapham & Morris, Ltd., are paying a final dividend of 15 per cent and a bonus of 10 per cent, making 30 per cent for the year (against 25 per cent).

The Calcutta Electric Supply Corporation, Ltd., is again paying an interim dividend of 3 per cent tax free.

Enfield Cables, Ltd., has announced an interim dividend of 3¾ per cent (unchanged).

The Ever Ready Trust, Ltd., is paying an unchanged interim dividend of 3 per cent on the ordinary and deferred shares.

New Companies

Bennett, Fielding & Co., Ltd.—Registered September 30th. Capital, £10,000. Manufacturers, repairers, agents and dealers in wireless and television sets, electrical fittings, etc. Directors: L. Bennett (permanent), K. M. Fielding, N. R. Earnshaw and F. S. Nickson. Regd. office: Swainson Street, Blackpool.

Ring Motors, Ltd.—Registered October 1st. Capital, £3,000. Electrical engineers, manufacturers and dealers in electric motors, rotary convertors, etc. Permanent directors: P. R. A. Cobb, W. Scott, A. Normington and S. W. Divers. Regd. office: 76, Roundwood Road, Northenden, Manchester.

Sterling Batteries (1947), Ltd. — Registered October 7th. Capital, £100. Directors: E. N. Rowbotham, director of Ever Ready Co. (Gt. Britain), Ltd., and F. Lawrence. Regd. office: Bowmans Place, Holloway, N.7.

H. G. W. & Partners, Ltd.—Registered September 27th. Capital, £1,500. Electrical and general engineers, etc. Directors: H. G. Whitehead, N. C. Norner and G. F. W. Gifford. Secretary: E. G. Payne. Regd. office: 82, Victoria Street, S.W.1.

Oro Works, Ltd.—Registered September 27th. Capital, £500. Manufacturers, wholesale and retail dealers, and agents for manufacturers of domestic and general electrical equipment and appliances, etc. Subscribers: J. Brodie and Z. B. Lewinski. Regd. office: 11, Greek Street, W.1.

Singfield & Sons, Ltd.—Registered September 25th. Capital, £100. Electrical engineers, etc. Directors: A. Singfield and Jenny Singfield, Regd. office: 38, Upper Green Street, Mitcham.

R. E. Galpin, Ltd.—Registered October 3rd. Capital, £500. Electricians, radio and electrical engineers, etc. The directors are: R. E. Galpin, Mrs. Ethel M. Galpin, W. Sainsbury, and W. R. Sainsbury. Regd. office: Radio House, Waun y Gross Avenue, Rhiwhina, Glam.

Sussex Electronics, Ltd.—Registered October 3rd. Capital, £100. T. C. Howell is the first director.

Increases of Capital

Paragon Electric, Ltd.—Capital increased by £11,000 beyond the registered capital of £4,000.

H. W. Herbert, Ltd.—Capital increased by £10,400 beyond the registered capital of £22,600.

Telephone Rentals, Ltd.—Capital increased by £500,000 beyond the registered capital of £1,000,000.

Bankruptcies

A. Lawson, 261, Park West, Edgware Road, London, W.1, electrical engineer.—Application for discharge to be heard on October 28th at Bankruptcy Buildings, Carey Street, London, W.C.2.

Liquidations

Ariel Electric Co., Ltd., 3, Thanet House, Craven Road, Paddington, London, W.2, radio and electrical engineers.—At a meeting of the creditors on October 9th it was decided to confirm the voluntary liquidation of the company with Mr. J. T. Morgan, 11 Argyll Street, London, W.1, as liquidator. A committee of inspection was also appointed.

STOCKS AND SHARES

THE Autumn Budget now being a matter of certainty, Stock Exchange markets await its advent without enthusiasm. The Chancellor of the Exchequer having announced his intention of maintaining a cheap money policy, a general hardening of British Government issues took place, with other gilt-edged securities sympathetically affected. Industrials, however, suffered from the grim outlook painted by Sir Stafford Cripps, added to which there is the expectation of taxes being increased before the end of the year. After remaining steady for a week or so, the prices of ordinary shares in the industrial and commercial group gave way. Sellers became more pressing; previous buyers withdrew supporting limits. Nevertheless, there is a considerable amount of money, constantly accumulating, that requires channels for its employment. The would-be purchaser frequently finds that the particular stock or share that he wants cannot be bought as cheaply as he expects to get it.

Budget Shadows

Industrial markets recoiled appreciably in the face of the latest Government warnings about the state of national affairs, but the week has brought few changes of much consequence in electrical equipment shares. Gains in Johnson & Phillips, 3s. up at 70s., and Telegraph Constructions at 47s. 6d., are balanced by declines in English Electric to 56s., Midland Electric Manufacturing to 8¾ and H.T.A. to 13s. 9d. British Thermostat and Switchgear & Cowans are better at 25s. and 17s. respectively. Murex at 87s. 6d. have added another 3s. 9d. to the advance which followed the annual report. Babcocks at 70s. are 2s. 6d. lower. Electricity supply shares are virtually unchanged. After wide fluctuations, Cable & Wireless ordinary 170 shows a net gain of 2½ points. Atlas Electrics have risen a further 1s. 3d. to 14s. 3d. on the assumption of an early ratification of the Montevideo tramway sale.

Equipment and Manufacturing

From the Cripps export targets, investment was given last month a pointer towards the market in electrical and other engineering shares, because of the preference likely to be afforded these industries. These markets have, in consequence, been generally well supported. In detail, however, discrimination has been complicated by the Ministry of Supply's subsequent plan for assisting the attainment of the targets by allocating steel supplies in strict relation to the export performance of individual firms. In view of the implications for those whose export business fails to satisfy the authorities, the effect has been, if anything, to prompt a further withdrawal from speculative industrials into the circle of companies solidly established, financially and commercially, in the essential home and export markets. Few shares are considered to give a better answer to present requirements than do those of the leading manufactuers of electrical generating plant and other equipment.

"Emmies"

The Electrical & Musical Industries' financial year ends with September. The dividend is declared two or three weeks later and the report appears, as a rule, towards the end of November. From 1943 to 1946 inclusive, the company paid dividends of 6 per cent plus a bonus of 2 per cent, following upon 6 per cent in 1941 and 1942. The market had been expecting a repetition this time of the previous 8 per cent and the price of the shares has recently been revolving around 20s. Upon announcement that the dividend will be 6 per cent without addition of the bonus, the price gave way to 17s., and no little disappointment was expressed at the falling away of profits shown in the preliminary statement of accounts.

The highest price touched by E.M.I. shares during the past twelve months was 29s. 6d. and the current quotation compares with 20s. as the lowest since 1942. At one time, these shares occupied the foremost position amongst the speculative favourites in the industrial markets, but active interest has recently subsided, with the result that the shares have come into the class of investments deemed to have a future sufficiently promising to justify a modest yield at the present time. Disappointment with the company's figures led to falls in Deccas to 30s., and in Cossors to 20s.

Christy Bros.

Christy Bros. & Co., Ltd., held a meeting last week to consider a resolution for the company to be treated as an electricity holding company. The business is that of electrical engineers and contractors, specialising in electric lighting installations, including design and erection of power stations. The purpose of the resolution becomes obvious when it is remembered that the company inaugurated a number of electricity undertakings, and retains substantial interests in them and in other concerns.

Dividends and Yield

Some years ago a subsidiary company, Christy Brothers (Wireless Relays), Ltd., was formed to operate broadcast relay services in Chelmsford and St. Neots. Since then, licences have been acquired for service in other parts. The number of subscribers to the subsidiary company's undertakings, up to August last, was 4,752. The parent company has paid a dividend of 17½ per cent for four consecutive years, following a previous excellent dividend record, the earnings each year being substantially in excess of the figure distributed to shareholders. At the present price of 75s. the yield on the basis of a 17½ per cent dividend is £4 13s. 4d. The market in the shares is a limited one.

Portuguese Imports

Considerable Revival in 1946

THE import trade of Portugal in electrical goods, after a falling-off in most categories between 1944 and 1945, went ahead in 1946. Particularly noteworthy was the increased trade in accumulators, wireless and telephone apparatus, wires and cables and power plant. Supplying countries were much the same as in 1945 except that Britain took a greater share and Holland regained her predominance in the radio business. A large credit has recently been opened to enable the Portuguese Ministry of Public Works to buy foreign machinery.

The accompanying table shows the values of the imports of the principal groups of electrical goods in 1946, with increases or decreases compared with 1945. (100 escudos equal £1.)

Class	1946 Escudos (000)	Inc. or dec. on 1945
Accumulators and condensers weighing per cell less than 8 kg	4,889	+ 3,064
From United States	2,433	+ 1,610
„ *Spain*	774	− 595
„ *Switzerland*	216	− 45
„ *Great Britain*	955	+ 781
Other accumulators, condensers and parts	3,026	+ 712
From Spain	734	− 635
„ *United States*	801	+ 297
„ *Switzerland*	244	+ 103
„ *Great Britain*	1,092	+ 1,005
Batteries, dry	1,647	+ 1,041
From United States	580	+ 315
„ *Great Britain*	499	+ 367
„ *Sweden*	41	− 42
Batteries, other	64	+ 33
From Great Britain	54	+ 23
Loudspeakers	1,938	+ 1,567
From United States	1,275	+ 1,027
„ *Sweden*	148	+ 137
„ *Holland*	218	+ 218
Radio receiving apparatus	29,265	+ 20,417
From United States	9,048	+ 8,636
„ *Sweden*	3,314	− 346
„ *Switzerland*	305	− 1,712
„ *Holland*	12,380	+ 10,086
„ *Great Britain*	3,858	+ 3,486
Telephone apparatus	10,262	+ 7,550
From United States	465	+ 396
„ *Great Britain*	5,879	+ 5,404
„ *Sweden*	3,591	+ 1,679
Generators, motors, transformers and parts weighing up to 100 kg.	24,658	+ 12,708
From Holland	2,175	+ 1,993
„ *United States*	5,294	+ 4,374
„ *Switzerland*	6,751	+ 1,444
„ *Sweden*	1,523	− 562
„ *Great Britain*	6,940	+ 5,870
Ditto weighing 100 to 500 kg.	10,951	+ 5,345
From Great Britain	3,228	+ 2,833
„ *Sweden*	899	+ 298
„ *Switzerland*	3,053	− 1,123
„ *United States*	1,401	+ 1,179
Complete installations for telephone exchanges (not including telephones, accumulators or dynamos)	22,616	+ 20,903
From Great Britain	11,527	+ 10,189
„ *Sweden*	9,846	+ 9,586
Lamps for lighting or heating	8,832	+ 6,479
From United States	1,162	− 454
„ *Holland*	5,728	+ 5,352
„ *Great Britain*	831	+ 586
Lamps, other electric	5,573	+ 2,204
From United States	3,120	+ 2,172
„ *Great Britain*	848	− 248
„ *Holland*	1,147	+ 736
Vacuum cleaners	2,325	+ 1,883
From Sweden	1,645	+ 1,211
„ *Great Britain*	351	+ 344
Insulating materials and porcelain insulators	8,863	+ 6,253
From United States	2,365	+ 1,975
„ *Great Britain*	2,235	+ 2,213
„ *Sweden*	1,387	+ 707
„ *Switzerland*	2,241	+ 1,714
Insulated wire or cable, textile-covered, weighing up to 120 grammes per metre	3,717	+ 3,080
From Great Britain	2,015	+ 1,725
„ *United States*	488	+ 334
„ *Sweden*	118	+ 49
„ *Belgium*	1,055	+ 1,055
Ditto, weighing over 120 grammes per metre	8,024	+ 4,375
From Great Britain	6,133	+ 2,649
Ditto, with other insulation and metal protected	36,446	+ 28,959
From Great Britain	31,704	+ 28,438
„ *United States*	663	− 2,019
„ *Spain*	1	− 1,181

Indian Power Schemes

THE Ahmedabad Electricity Company has nearly finished the construction of a new power station for the Government of Bombay. Power will at first be supplied by two 15,000-kW steam turbine sets. Two similar sets will be added later to meet the demand anticipated in three or four years' time.

B.I. Callender's Cables, Ltd., is building a 66/110-kV transmission line from Ahmedabad to Baroda and the installation of 33- and 11-kV lines is now under negotiation. Transformers and substation control gear have been ordered.

The aim of the North Gujarat scheme is to take power in bulk from the Ahmedabad Electricity Co.'s station at Sabarmati and distribute it in the North Gujarat area. It will involve the construction of 70 miles of 66/110-kV line, 14 miles of 33-kV and 50 miles of 11-kV transmission lines, and about 480 miles of distribution lines.

In South Gujarat the site provisionally selected for the erection of a new power station near Surat is being surveyed. The two 7,500-kW turbo-alternators to be installed in the power station have been ordered. The station will supply power for areas between Surat and Bulsar over a 46-mile e.h.v. transmission line.—*Reuter's Trade Service* (Bombay).

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1941

GENERAL Electric Co., Ltd., D. E. Jones and J. W. Ryde.—" Crystal contacts of which one element is germanium." 8997. July 16th, 1941. (592659.)

1943

British Thomson-Houston Co., Ltd.—" Permanent magnet structures." 10532. June 30th, 1942. (592568.)

Western Electric Co., Inc.—" Apparatus for generating or controlling high-frequency electromagnetic waves." 13641. March 11th, 1941. (592569.) " Radio direction finding systems." 17682. June 28th, 1941. (592570.) " Electron discharge apparatus." 21941. May 3rd, 1941. (592572.)

Standard Telephones & Cables, Ltd.—" Arrangements for defining a glide path for a landing aircraft." 19827. February 1st, 1940. (592571.) " Radio navigational systems." 21251. August 28th, 1942. (Addition to 590460.) (592748.)

1944

Standard Telephones & Cables, Ltd.—" Arrangements for delaying electric pulses." 1678. December 8th, 1942. (592573.) " Determination of the time interval between an electrical pulse and its echo." 1815. October 31st, 1942. (592574.) " Arrangements for delaying electric pulses." 1816. January 30th, 1943. (592575.) " Directional antenna arrays." 2274. March 12th, 1942. (592576.) " Electric obstacle location systems." 2275. September 14th, 1942. (592616.) " Calibration arrangements for oscillographs and their application to radio obstacle detection systems." 2277. December 4th, 1942. (592577.) " Radio detection systems for measuring the distances of obstacles." 2609. October 8th, 1942. (592617.) " Radio obstacle detection systems employing reflected pulses." 4871. July 24th, 1942. (592579.) " Thermionic timing means." 5050. November 23rd, 1942. (592580.) " Radio detection systems." 9174. March 5th, 1943. (592582.) " Pulse modulation systems." 10821. August 24th, 1942. (592584.) " Systems for generating time modulated pulses." 11032. August 24th, 1942. (592585.) " Electron discharge device." 20670. December 24th, 1941. (592667.)

Power Jets (Research & Development), Ltd., and W. R. Hawthorne.—" Internal combustion turbine power plants." 1805. January 31st, 1944. (592615.)

Marconi's Wireless Telegraph Co., Ltd.—" Radio altimeters and speed indicators." 3322. August 29th, 1942. (592749.)

Western Electric Co., Inc.—" Electron discharge apparatus and electrodes for use therein." 3578. October 31st, 1941. (592750.) " High-frequency electrical discharge apparatus." 4446. December 11th, 1941. (592578.) " Time interval measuring systems particularly for use with object locating devices." 13867. October 19th, 1942. (592619.)

Farnsworth Television & Radio Corporation.—" Television signal amplifier." 8930. March 29th, 1943. (592581.)

National Cash Register Co.—" Counting means comprising electronic devices." 9741. August 20th, 1941. (592751.)

General Electric Co., Ltd., O. W. Humphreys and N.L.A. Pollard.—" Moulding of plasticized synthetic rubber-like materials." 10261. May 26th, 1944. (592583.)

British Thomson-Houston Co., Ltd.—" Electric resistance units." 11427. June 15th, 1943. (592586.)

International Business Machines Corporation.—" Thermionic valve circuits." 14024. June 19th, 1943. (592753.)

Rotol, Ltd., H. Burton and P. G. Parish.—" Automatic high-frequency heater for heating plastic moulding powders and the like." 18389. September 26th, 1944. (592664.)

Metropolitan-Vickers Electrical Co., Ltd., and R. Hathaway.—" Systems for the automatic regulation of power factor." 21591. November 3rd, 1944. (592622.)

Smart & Brown (Engineers), Ltd., and W. H. Spivey.—" Installation in walls or the like of electrical contact-making apparatus such as switches or wall-sockets." 23707. November 28th, 1944. (592624.)

1945

E. A. H. French.—" High-pressure mercury vapour lamps." 557. January 5th, 1945. (592626.)

Patelhold Patentverwertungs & Elektro-Holding, Ekt.-Ges.—" Radiolocation systems." 1310. January 18th, 1944. (592596.)

Marconi's Wireless Telegraph Co., Ltd.—" Modulation detector circuits for angle modulated oscillations." 2164. January 27th, 1944. (592628.)

Standard Telephones & Cables, Ltd., and E. O. Willoughby.—" Di-pole antenna systems." 3047. February 6th, 1945. (592760.)

English Electric Co., Ltd., and K. F. Barlow.—" Cooling of welding or heating electrodes." 4699. February 25th, 1946. (592598.)

Lumalampan Aktiebolag.—"Electric discharge tube." 5679. March 9th, 1944. (592673.)

British Mechanical Productions, Ltd., and S. T. Deakin.—"Socket members for electrical pin-plug and socket connectors." 8358. April 4th, 1944. (592605.)

General Electric Co., Ltd., and G. R. Polgreen.—"Aerial arrangements for radio signalling systems." 9296. April 13th, 1945. (592763.)

Siemens Electric Lamps & Supplies, Ltd., and H. Austin.—"Fluorescent materials." 9686. April 18th, 1945. (592675.)

Metropolitan-Vickers Electrical Co., Ltd., H. K. Ramsden and J. T. Sharples.—"Electric resistances." 12182. May 15th, 1945. (592635.)

Sylvania Electric Products, Inc.—"Composite metal vacuum-tight glass inserts and methods of manufacture." 12308. March 4th, 1944. (592637.)

J. B. Pierce Foundation.—"Connector unit for electric conduits." 12863. August 16th, 1944. (592681.)

Radio & Television Trust, Ltd., and C. P. V. Vaufrouard.—"Terminal panels." 13014. May 24th, 1945. (592686.)

T. G. Farish.—"Electric fires." 13167. May 25th, 1945. (592724.)

Soc. Française de Construction de Bennes Automatiques.—"Electric control means for self-acting grab buckets." 13172. December 11th, 1943. (592725.)

British Thomson-Houston Co., Ltd.—"Electric control systems." 13203. May 25th, 1944. (592766.)

Soc. Française Radio-Electrique.—"System of submarine sounding." 13349. January 20th, 1943. (592728.)

Sperry Gyroscope Co., Inc.—"Signal control apparatus for use in electrical movement-control systems." 13378. May 27th, 1944. (592729.)

Power Centre Co., Ltd., A. H. Stevens and G. A. Stevens.—"Supports for electric conductors." 13513. May 30th, 1945. (592770.)

Standard Telephones & Cables, Ltd., and C. N. Smyth.—"Methods of soldering metal details." 13622. May 30th, 1945. (592733.)

B. Schwarz.—"Control and operation of a.c. commutator motors, particularly for hoisting and like purposes." 13696. May 31st, 1945. (592741).

Automatic Telephone & Electric Co., Ltd., and C. R. Woodland.—"Automatic switches as used in telephone systems." 13759. June 1st, 1945. (592739.)

Standard Telephones & Cables, Ltd.—"Combined television and sound receiver system." 13816. June 12th, 1944. (592741.) "Multi-channel electric pulse communication receivers." 13869. July 29th, 1944. (592779.) "Arrangements for selecting electric pulses according to duration." 16326. May 15th, 1943. (592789.)

General Electric Co., Ltd., and E. J. Pitman.—"Electric fuse boxes." 13834. June 1st, 1945. (592742.)

Precision Developments Co., Ltd., and G. Olah.—"Magnetic brakes." 13912. June 2nd, 1945. (592698.)

C. J. Cox and G. Checkley.—"Electrical heating apparatus." 13968. June 4th, 1945. (592785.)

Engineers' Responsibilities

THE address delivered by MR. D. DYSON RAYNER (Portsmouth Corporation) as chairman of the Southern Centre of the Institution of Electrical Engineers commenced with a review of electrical progress.

Engineers were urged to broaden their outlook and knowledge of social and economic, as well as technical, problems in order that they might be the better fitted to take their rightful place in international and national affairs in so far as engineering was concerned.

Many industries had grown equally rapidly, but the electrical industry alone had reached the stage at which it "controlled" the social and economic life of the nation. One shuddered at the thought of the consequences of a complete shut-down of all power stations simultaneously throughout the country. Mr. Rayner hoped that electrical engineers would never have cause to forget their responsibilities.

Only by the combined efforts of engineers in different branches of the profession could the most efficient result be obtained. The need for liaison between different branches was growing because of the increasing use of automatic electrical control and methods in widening spheres. Much closer association and co-operation was needed between members of the three senior institutions.

To illustrate his point Mr. Rayner remarked that the main components of power station plant were well standardized by their respective makers, but not so the auxiliaries, particularly the methods of controlling them. Amazing variations were required by different authorities to produce the same results, which tended to retard producion and delivery.

As a practical example of mutual engineering interests, Mr. Rayner proceeded to explain in detail and at length, with the aid of illustrations, graphs and demonstration equipment, some of the problems involved in the regulation of boiler output by means of draught fans driven by two-speed squirrel-cage motors in conjunction with vane control of fan output draught. That method was claimed to combine the advantages of constant speed with simplicity of control, which could be centralized and automatic.

The last part of the address concerned the growth of the I.E.E. membership and local Centre activities.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—Department of Civil Aviation. December 3rd. Radar distance measuring equipment beacons. Tender and Contract Committee, Melbourne.

Sydney County Council. November 6th. High- and low-voltage cables (Spec. 975). November 13th. 33-kV cable (Spec. 977). Comptroller of Stores.

Victoria State Electricity Commission. November 12th. Automatic telephone equipment (Spec. 47-48/60).

Queensland State Electricity Commission. November 19th. Hydro-electric plant for Somerset dam (Spec. 63).

Coventry.—October 27th. Housing Committee. Electrical installations in 448 houses. (October 10th.)

Edinburgh.—November 10th. Electricity Department. 33-kV ring main switchgear and 5,000-kVA transformers. (October 10th.)

Eston.—November 15th. U.D.C. E.h.v. ring main switchgear, l.v. switchgear, one 500 kVA transformer, and e.h.v. and l.v. underground cables. (See this issue.)

Martley.—November 3rd. R.D.C. Two sets of direct-coupled electrically driven centrifugal pumps for crude sewerage.—Willcox, Raikes & Marshall, 33, Great Charles Street, Birmingham, 3.

North Scotland.—Hydro-Electric Board. Ten miles of 132-kV steel tower transmission lines. (October 3rd.)

New Zealand.—Hydro-Electric Department. January 20th, 1948. High-voltage control and relay boards for Otahuhu and Bunnythorpe substations (Contracts 44-47). Tenders Committee, Wellington.

Plymouth.—November 1st. Electricity Department. Meters, time switches, underground joint boxes, underground disconnecting boxes. (See this issue.)

Rochdale.—November 3rd. Electricity Department. 33-kV underground cables. (October 3rd.)

Stoke-on-Trent.—November 12th. Electricity Department. Two 1,000-MVA outdoor oil circuit breakers, switchgear structures and two indoor control panels, as an extension of existing 33-kV equipment. (October 3rd.)

Orders Placed

Gillingham.—Corporation. Accepted. Electrical installations in seventy-two houses (£2,361).—Lauray Electrical Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alloa.—Miners' houses (200), Stirling and Alloa Roads; Scottish Special Housing Association, Ltd.

Angus.—Conversion of huts into 30 temporary houses at Tealing for County Council; county clerk, County Buildings, Forfar.

Banbury.—Houses (50), Hightown estate, for Great Western Housing Association, Ltd.; W. & A. Collisson, builders, 32, Britannia Road.

Berwick.—Houses (100) for miners for the T.C.; borough engineer.

Brighton.—Primary school at Hollingbury (£160,166); borough engineer.

Bromley.—Additions to works, Wray (Optical Works), Ltd., Ashgrove Road; G. T. Harman, 90a, Lewisham High Street, S.E.13.

Bury.—Modern school, Seedfield (£112,500); borough engineer, Bank Street.

Chard.—Bungalows (59); borough engineer, Somerset House, Chard.

Chatham.—Reconstruction and extension of Royal Sailors' Home; P. W. W. Thompson, Bank Chambers, Rochester.

Cheadle.—Houses (60), Black Lane, for R.D.C.; R. J. Addison, builder, Caverswall Road, Blythe Bridge, Staffs.

Chorley.—"Airey" houses (40), Eccleston and Coppull; T. Berry, clerk to R.D.C., Gillibrand Street.

Croydon.—Heathfield Primary Schools; Riches & Blythin, 77, Park Lane,

Dewsbury.—Extensions, Westfield Mills, for W. Crabtree & Sons, Ltd.; Firth, Son & Blackburn, architects, Broadway House, Crackenedge Lane.

Droxford.—Houses (68); R.D.C. surveyor, Bishop's Waltham.

Dundee.—Nursery school, Craigie Drive; city engineer, Town Hall, City Chambers.

Easington.—Aluminium houses (258) for the R.D.C.; surveyor.

Edmonton.—104 houses, 20 flats and eight shops at Cuckoo Hall estate, for T.C.; borough engineer and surveyor, Town Hall,

Factory premises, Angel Road and Dysons Road; M. K. Electric, Ltd., Wakefield Street.

Exeter.—Re-development of city centre, including police buildings, General Post Office, etc.; borough engineer.

Gateshead.—School at Lobley Hill; H. J. Cooke, chief architect, Swinburne Street.

Glasgow.—Four new blocks at North Cardonald for Hillington Industrial Estates; manager, 3, Woodside Place.

Factory for J. Bibby & Sons, Ltd., cattle feed manufacturers, etc., Liverpool, near King George V Dock; manager.

Extension of double-storey shed at Lancefield quay (£49,568) for Clyde Navigation Trust; Wm. Baird & Son, Ltd., contractors.

Grimsby.—Foundry, Railway Street; Fowler & Holden (Grimsby) Ltd., Church Street.

Factory, Bourne Lane; Disabled Persons Employment Corporation, Ltd., 25, Buckingham Gate, London, S.W.1.

Lanarkshire.—New factory to be operated by Francis Sumner & Co. (1920), Ltd., Glossop, Derbyshire, at Shotts; the manager.

Lincoln.—Infants' school at Skellingthorpe Road, for E.C.; Watkins & Coombes, architects, Heslam Chambers, 191, High Street.

Macclesfield.—Offices, Black Road (£25,000), for Ministry of National Insurance; Cooper Bros. and John Clayton, builders, Catherine Street.

Northwich.—Rehabilitation centre (£25,000), for Victory Infirmary Board; Wright & Hamlyn, architects, Patten Chambers, Winmarleigh Street, Warrington.

Paisley.—Extensions to works, Geo. Dobie & Sons, Ltd., tobacco manufacturers; Abercrombie & Maitland, 1, County Place.

Puncheston (Pem.).—New county school, for E.C.; county architect, Haverfordwest.

Shotley Bridge.—Improvements and adaptation at Emergency Hospital (£14,483); city architect, 18, Cloth Market, Newcastle-on-Tyne.

South Shields.—Model dairy and bakery for the Jarrow and Hebburn Co-operative Society (£80,000); C.W.S. Architects' Department, 90, Westmorland Road, Newcastle-on-Tyne.

School, Horsley Hill, for E.C.; J. Wilkes, architect, Sunderland Road.

Stretford.—Junior school, Barton Road; county architect, Fishergate Hill, Preston.

Surbiton.—Primary school, Moor Lane, for Surrey E.C.; Limpus & Son, builders, 7, Kingston Hill, Kingston-on-Thames.

Government offices on Barwell Court site; Ministry of Works, Abell House, John Islip Street, S.W.1.

Wakefield.—Adaptations at Wentworth Woodhouse, for women's training college (£80,000); West Riding county architect.

Watford.—Factory premises, Station estate, Balmoral Road, Dewspray Products, Ltd.; Charles Curme, 10, Bournehall Avenue, Bushey.

Wellington (Salop).—Houses (68), High Ercall and Tibberton, for R.D.C.; Walter B. Bond, Colmore Chambers, 3, Newhall Street, Birmingham, 3.

Whitley Bay.—Electrical installations in 94 houses, for U.D.C.; E. Roberts, surveyor, U.D.C. Offices.

Wimbledon.—Extensions to Nelson Hospital, Kingston Road; Lanchester & Lodge, architects, 10, Woburn Square, London, W.C.1.

Three blocks of flats and 43 houses, West Side House estate, for B.C.; Buchanan & Coulter, 5, Bedford Row, W.C.1.

Trade Marks

APPLICATIONS has been made for the registration of the following trade marks. Objections may be entered within one month from October 8th:—

YORKEEN (design). No. 639,554. Class 7. Engines and motors and components; turbines, dynamos, electricity generators, magnetos, etc.—Yorkshire Factoring Co., Ltd., 79–90, Spring Gardens, Doncaster.

S.T.C. (design). No. 647,136. Class 9. Electric control apparatus operated by d.c. impulses.—Standard Telephones & Cables, Ltd., Connaught House, 63, Aldwych, W.C.2.

VITALITE. No. B647,848. Class 9. Dry batteries for export.—Brooks & Bohm, Ltd., 90, Victoria Street, London, S.W.1.

PETER PAN. No. 648,379. Class 9. Radio sets (complete) and parts thereof not included in other classes.—Peter Pan Radio, Ltd., Radio Works, Charlotte Street, Leamington Spa.

HERALD. No. 648,498. Class 9. Electric bells and buzzers.—British N.S.F. Co., Ltd., Ingrow Bridge Works, Keighley, Yorks.

ACRALAC. No. 649,515. Class 9. Electrical apparatus and instruments included in Class 9, and radio and scientific apparatus.—A. Crabtree & Co., Ltd., Lawkholme Crescent, Keighley.

ROTALAG. No. 649,709. Time-delay action contrivances for use in controlling the operation of electrical and mechanical apparatus.—H. E. R. Thomas, The Homestead, Crick, nr. Rugby.

COSIM. No. 650,183. Class 9. Electrical apparatus and instruments included in Class 9; and wireless, scientific, nautical, surveying, photographic, optical and measuring apparatus and instruments.—Cobb-Slater Instrument Co., Ltd., Dale Road and Rutland Street, Matlock.

BYLOCK (design) No. 649,998. Class 9. Electrical apparatus and appliances for domestic purposes and included in Class 9, electric vacuum cleaning apparatus and electric air blowers.—Bylock Electric, Ltd., 109, South Street, Ponders End, Middx.

AERMONIC. No. 650,530. Class 9. Radio and television apparatus and parts thereof included in Class 9.—James Christie & Sons, Ltd., 246, West Street, Sheffield, 1.

LIGHTFOOT (design.) No. 649,900. Class 10. Refrigerating apparatus and parts thereof not included in other classes.—Lightfoot Refrigeration Co., Ltd., Abbeydale Road, North Circular Road, Wembley, Middx.